ALBERTA
OIL SANDS
FACTS & FIGURES

Alberta
ENERGY AND
NATURAL RESOURCES

12

101-07491/

ALBERTA OIL SANDS FACTS & FIGURES

LEGISLATIVE LIBRARY OF ONTARIO
TORONTO
APR 17 1980
RECEIVED

Copes of this publication are available
on request from the Resource Information
Services Branch of the Department of
Energy and Natural Resources

ENR Report No. 110

Department of Energy and Natural Resources
9915 - 108th Street
Edmonton, Alberta, Canada
T5K 2C9

FOREWORD

Since this report was first prepared in 1974, much new interest has been generated in the Alberta oil sands. In 1978, the second surface mining operation began extraction and processing of oil sands for synthetic crude oil production, and numerous experimental pilot projects are operating to recover bitumen from deep deposits not suited to surface mining. One of these pilot projects has progressed to the stage where a permanent facility is proposed and a third surface mining operation is also planned.

Except for a slight reduction in 1975, overall exploration activity in Alberta has increased steadily since 1974. In some cases this exploration has resulted in the discovery of both bitumen-impregnated sands and associated natural gas within the same formation or zone. Legislation existing prior to July 1, 1978 restricted the manner in which the rights found could be disposed of and also left some uncertainty about the exact rights that could be conveyed under existing Crown agreements. The amending legislation of July 1, 1978 redefined "oil sands" to preclude associated petroleum and natural gas which may be recovered through a well by conventional methods, thus permitting separate disposition of the rights.

The amendments allow the holder of a petroleum and natural gas agreement issued prior to July 1, 1978 to apply for the right to oil sands, once having drilled a well proving the presence of oil sands. On the other hand, agreements granting the rights to petroleum and natural gas do not now convey to the holder the right to apply for an oil sands disposition. By eliminating the requirement for an existing petroleum and natural gas agreement, provision has now been made for direct acquisition of oil sands rights. Policy is still being developed in this regard and industry will be advised how and when such dispositions may take place.

The distinction between "bituminous sands" and "oil sands" has been removed and the new legislation provides for the conversion of bituminous sands rights to oil sands rights. Because many bituminous sands leases remain to be converted, both terms are still used in various tables and figures in this publication.

Other significant amendments are reported in the Information Letters included in the Appendix in this report. Also included in the Appendix are the Oil Sands Regulations, 1978, the Oil Sands Royalty Regulation No. 1 and The Experimental Oil Sands Royalty Regulations. Interpretation and clarification of this legislation can be obtained from the Mineral Agreements Branch of this Department.

Changes in oil sands holdings of individual companies occur from time to time, and these changes will affect the data presented here. Nevertheless, the overall picture of land holdings as they exist at this time should be useful to those interested or involved in the development of the Alberta Oil Sands.

TABLE OF CONTENTS

Page

List of Maps i

List of Tables ii

List of Figures iii

List of Appendices v

Definitions vii

Oil Sands Overview 1

Map of Major Oil Sands Deposits 3

General Statistics 5

Individual Deposit Statistics

- Athabasca Wabiskaw-McMurray 11
- Cold Lake 31
- Peace River Bluesky-Bullhead 39
- Wabasca 47

LIST OF MAPS

Page

Map 1 Location in Alberta of the Four Major Oil Sands Deposits 3

Map 2 Disposition of Lands in the Evaluated Area of the Athabasca Wabiskaw-McMurray Deposit. 13

Map 3 Disposition of Bituminous Sands Leases in the Surface Mineable Area of the Athabasca Wabiskaw-McMurray Deposit. 27

Map 4 Disposition of Lands in the Evaluated Area of the Cold Lake Deposits 33

Map 5 Disposition of Lands in the Evaluated Area of the Peace River Bluesky-Bullhead Deposit. 41

Map 6 Disposition of Lands in the Evaluated Area of the Wabasca Deposits 49

LIST OF TABLES

Page

Table 1 Land Disposition in the Four Major Oil Sands Deposits 6

Table 2 Individual Company Holdings of Crown Bituminous and Oil Sands Leases – Athabasca Wabiskaw-McMurray Deposit 17

Table 3 Disposition of Land by Method of Extraction – Athabasca Wabiskaw-McMurray Deposit 30

Table 4 Individual Company Holdings of Crown Oil Sands Leases – Cold Lake Deposits. 36

Table 5 Individual Company Holdings of Crown Oil Sands Leases – Peace River Bluesky-Bullhead Deposit 45

Table 6 Individual Company Holdings of Crown Oil Sands Leases – Wabasca Deposits 52

LIST OF FIGURES

Page

Figure 1 Reserves of Crude Bitumen In-Place in the Four Major Cretaceous Oil Sands Deposits 5

Figure 2 Reserves of Crude Bitumen In-Place, Attributable to Various Extraction Methods 5

Figure 3 Comparison of Disposition of Crown and Freehold Lands in the Four Major Cretaceous Oil Sands Deposits 7

Figure 4 Comparison of Holdings of Crown Leases by Major, Independent and Intermediate Size Companies in the Four Major Cretaceous Oil Sands Deposits 8

Figure 5 Comparison of Holdings of Crown Leases by Individual Companies in the Four Major Cretaceous Oil Sands Deposits 9

Figure 6 Comparison of Holdings of Crown Oil Sands Prospecting Permits by Individual Companies in the Four Major Cretaceous Oil Sands Deposits. 10

Figure 7 Comparison of Alberta Government Revenue Derived from Royalties, Fees and Rentals and Bonuses from Sales from All Deposits of Oil Sands 10

Figure 8 Comparison of Holdings of Crown Leases by Individual Companies in the Athabasca Wabiskaw-McMurray Deposit 15

Figure 9 Comparison of Holdings of Crown Oil Sands Prospecting Permits by Individual Companies in the Athabasca Wabiskaw-McMurray Deposit 16

Figure 10 Comparison of Disposed Crown Rights, Undisposed Crown Rights and Freehold Acreage in the Athabasca Wabiskaw-McMurray Deposit 16

LIST OF FIGURES

Page

Figure 11 Comparison of Holdings of Crown Bituminous Sands Leases by Individual Companies in the Surface Mineable Area of the Athabasca Wabiskaw-McMurray Deposit 29

Figure 12 Comparison of Holdings of Crown Leases by Individual Companies in the Cold Lake Deposits 35

Figure 13 Comparison of Holdings of Crown Oil Sands Prospecting Permits by Individual Companies in the Cold Lake Deposits 35

Figure 14 Comparison of Disposed Crown Rights, Undisposed Crown Rights and Freehold Acreage in the Cold Lake Deposits 35

Figure 15 Comparison of Holdings of Crown Leases by Individual Companies in the Peace River Bluesky-Bullhead Deposit. 43

Figure 16 Comparison of Holdings of Crown Oil Sands Prospecting Permits by Individual Companies in the Peace River Bluesky-Bullhead Deposit 44

Figure 17 Comparison of Disposed Crown Rights, Undisposed Crown Rights and Freehold Acreage in the Peace River Bluesky-Bullhead Deposit 44

Figure 18 Comparison of Holdings of Crown Leases by Individual Companies in the Wabasca Deposits 51

Figure 19 Comparison of Holdings of Crown Oil Sands Prospecting Permits by Individual Companies in the Wabasca Deposits 51

Figure 20 Comparison of Disposed Crown Rights, Undisposed Crown Rights and Freehold Acreage in the Wabasca Deposits 51

LIST OF APPENDICES

Page

Appendix 1 The Mines and Minerals Amendment Act, 1978
Bituminous and Oil Sands Legislation
– Information Letter 79-5 53

Appendix 2 The Mines and Minerals Amendment Act, 1978
Bituminous and Oil Sands Legislation
– Information Letter 78-20 54

Appendix 3 The Mines and Minerals Amendment Act, 1978
Bituminous and Oil Sands Legislation
– Information Letter 78-11 56

Appendix 4 The Mines and Minerals Act
Oil Sands Regulation, 1978
– Alberta Regulation 317/78
(Filed August 9, 1978) 59

Appendix 5 The Mines and Minerals Act
Oil Sands Royalty Regulation No. 1
– Alberta Regulation 318/78
(Filed August 9, 1978) 65

Appendix 6 The Mines and Minerals Act
The Experimental Oil Sands Royalty Regulations
– Alberta Regulation 287/77
(Filed October 20, 1977) 67

DEFINITIONS

Bituminous Sands - The oil sands being within townships 84 to 104 inclusive in ranges 4 to 18 inclusive, west of the 4th meridian and occurring in the McMurray Formation, being the stratigraphic formation lying above the upper Devonian carbonate sediments and below the Clearwater Formation.
(The Mines and Minerals Act 2. (1)2.)

Bituminous Sands Lease - A long-term agreement whereby the owner of the oil sands rights which occur in the McMurray Formation, as designated by the Energy Resources Conservation Board within townships 84 to 104 inclusive in ranges 4 to 18 inclusive, west of the 4th meridian, accords the lessee the right to win,work and obtain these oil sands.

Convertible Petroleum and Natural Gas Dispositions - An exploration agreement granting the right to explore for conventional petroleum and natural gas, including oil sands. The holder of such an agreement, granted before July 1, 1978, may apply for oil sands rights where drilling has established the presence of oil sands to the satisfaction of the Minister.

Crown Mineral Rights - Those owned by the Crown in the right of Alberta. For the purposes of this report Crown minerals in the right of Canada (Indian Reserves, etc.) are included in the freehold mineral rights category.

Crude Bitumen - A naturally occurring viscous mixture, mainly of hydrocarbons heavier than pentane, that may contain sulphur compounds, and that in its naturally occurring state is not recoverable at a commercial rate through a well.
(The Oil and Gas Conservation Act 2. (1)10.)

Freehold Mineral Rights - Those mineral rights owned by a party other than the Crown in right of Alberta. These include mineral rights granted to private citizens, companies and the Federal Government.

In-Place Reserves - Defined as the total resource in a deposit less any portion of it deemed unrecoverable by any foreseeable technology or under any foreseeable economic circumstances.

In-Situ Areas - Those portions of the oil sands deposits overlain by more than 500 feet of overburden. Such deposits are too deep to mine by surface mining methods and therefore require production by special drilling and "flushing" methods designed to reduce the viscosity of the heavy oil.

Oil Sands - (i) sands and other rock materials containing crude bitumen,
(ii) the crude bitumen contained in those sands and other rock materials, and
(iii) any other material substances in association with that crude bitumen or those sands and other rock materials,

but does not include petroleum or natural gas that in its naturally occurring state is recoverable through a well by conventional methods.
(The Mines and Minerals Act 2. (1)20.)

Oil Sands Lease - A long-term agreement whereby the owner of the oil sands accords the lessee the right to win, work and obtain oil sands that are known to exist in designated zones within the location.

Oil Sands Prospecting Permit - A short-term agreement granting the holder the right to explore for oil sands.

Surface Mineable Area - That part of the Bituminous Sands Area overlain by 150 feet or less of overburden. The depth of overburden limiting surface mining operations today is based on recovery economics and technology that may reasonably be anticipated in the near future.

Synthetic Crude Oil - The upgraded product obtained from crude bitumen. It is defined as a mixture, mainly of pentanes and heavier hydrocarbons, that may contain sulphur compounds, that is derived from crude bitumen and that is liquid at the conditions under which its volume is measured or estimated, and includes all other hydrocarbon mixtures so derived.
(The Oil and Gas Conservation Act 2. (1)41.)

Undisposed Crown - In this report, means Crown mineral rights that are not held under a petroleum and natural gas, oil sands or bituminous sands agreement.

THE OIL SANDS OF ALBERTA – AN OVERVIEW

The Alberta oil sands are among the largest deposits of their kind in the world and are estimated to contain about one trillion barrels of bitumen in-place. The four major deposits are Athabasca Wabiskaw-McMurray, Cold Lake, Peace River Bluesky-Bullhead and Wabasca, and underlie an area of some 27 000 square miles in eastern and northern Alberta. They vary in depth from surface outcrops to beds covered with more than 2500 feet of overburden.

The first known reference to the sands was made in 1778 by Peter Pond, an American fur trader for the Northwest Company who established a trading post near the present town of Fort McMurray, Alberta. He noted that the Indians used the sticky substance that oozed from the river banks to waterproof their canoes. A few years later, Alexander Mackenzie, a famous explorer of the Canadian west, wrote in his journal: "The bitumen is in a fluid state, and when mixed with gum, or the resinous substance collected from the spruce fir, serves to gum the Indians' canoes."

Serious interest in the oil sands did not develop, however, until about 1897 when the Geological Survey of Canada made the first drilling test to assess the nature and extent of the sands and to gather samples for study. One of the first developers was a German aristocrat, Count Alfred von Hammerstein, who was en route to the Klondike when he heard about the oil sands and decided to prospect for black gold instead. Von Hammerstein reasoned that if there was so much petroleum in association with the sand there must somewhere be pools of more liquid petroleum that could be reached by conventional drilling. He drilled an unsuccessful well to learn the oil sands would not give up their secrets easily. He was not the last.

In 1920, the Alberta Scientific and Industrial Research Council in Edmonton began a long-term study to determine how crude bitumen (as the molasses-like substance was called) could be separated from the oil sands with hot water. This method was pioneered by Dr. Karl Clark and became the focus of decades of research, and eventually became the basis of commercial production in 1967.

The crude bitumen occurs in beds of sand, usually partly cemented together, and in porous carbonate rocks. The sand grains are usually covered with a film of water, and bitumen occupies most of the remaining pore space, along with fine clay particles and other mineral matter and, occasionally, some natural gas.

About 0.7 million acres of the Athabasca deposit is overlain by 150 feet or less of overburden and is potentially capable of being mined from the surface. The remaining 16.6 million acres of the four major deposits vary considerably in quality and are buried at such depths that the crude bitumen can only be recovered by in-situ methods. Generally,

these methods involve heating the extremely viscous bitumen with steam so that it will flow and can be pumped to the surface. The potential in-situ reserves of bitumen are covered by more than 500 feet of overburden, while the extraction technique for those reserves lying between 150 and 500 feet is uncertain at present. It is unlikely, however, that more than one-third of the crude bitumen reserve will ever be recovered.

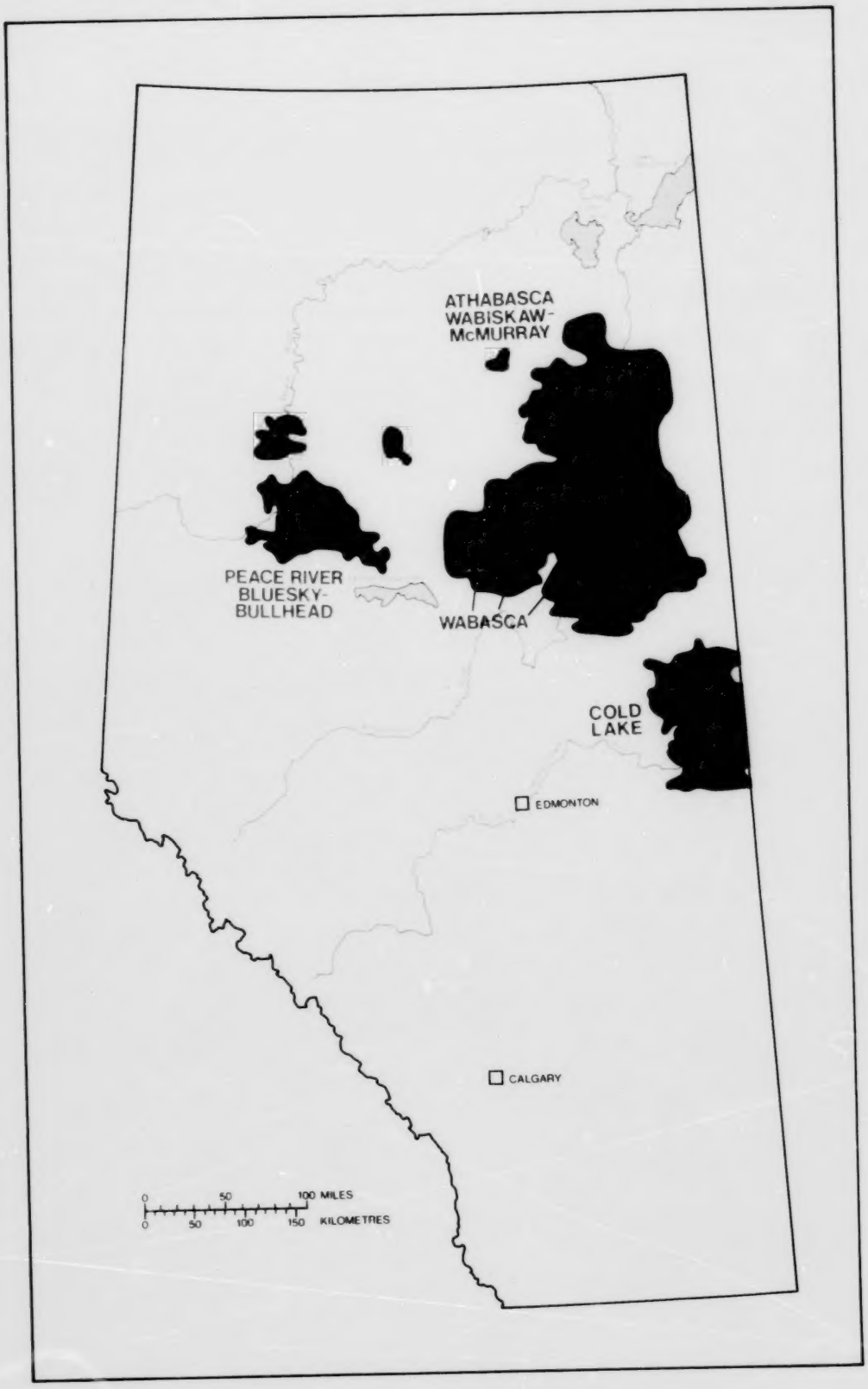
At the end of 1978, over five and one-half million acres of Alberta's Crown lands were under disposition in the oil sands deposits. Undisposed Crown Rights amounted to an additional 5.65 million acres and 0.63 million acres were held privately as freehold.

Some 5.07 million acres of Crown lands are held by industry as convertible dispositions. For those agreements in force before July 1, 1978, the holder may apply for oil sands rights where drilling has established their presence.

Another 0.28 million acres of Crown lands have been reserved to the Alberta Oil Sands Technology and Research Authority (AOSTRA). The lands may be utilized in future joint venture schemes with industry to produce bitumen. AOSTRA was created by the Alberta government in 1974 to administer a $100 million fund for research into technology to recover and process crude bitumen and other oil sands products from oil sands deposits. Many pilot projects have since been funded in joint venture arrangements with industry.

Major companies control most of the acreage in the oil sands. The vast amounts of capital and the technical expertise required to develop oil sands properties have generally been available only from them.

Leases are issued by the government for periods of 21 years and may be renewed for further terms to accommodate a plant or other works extracting or processing oil sands material. Cumulative revenue from lease rentals to December 31, 1978 was $35.5 million while royalties from the commercial surface mining operation and pilot projects amounted to $110.2 million.



MAP 1. LOCATION IN ALBERTA OF THE FOUR MAJOR CRETACEOUS OIL SANDS DEPOSITS

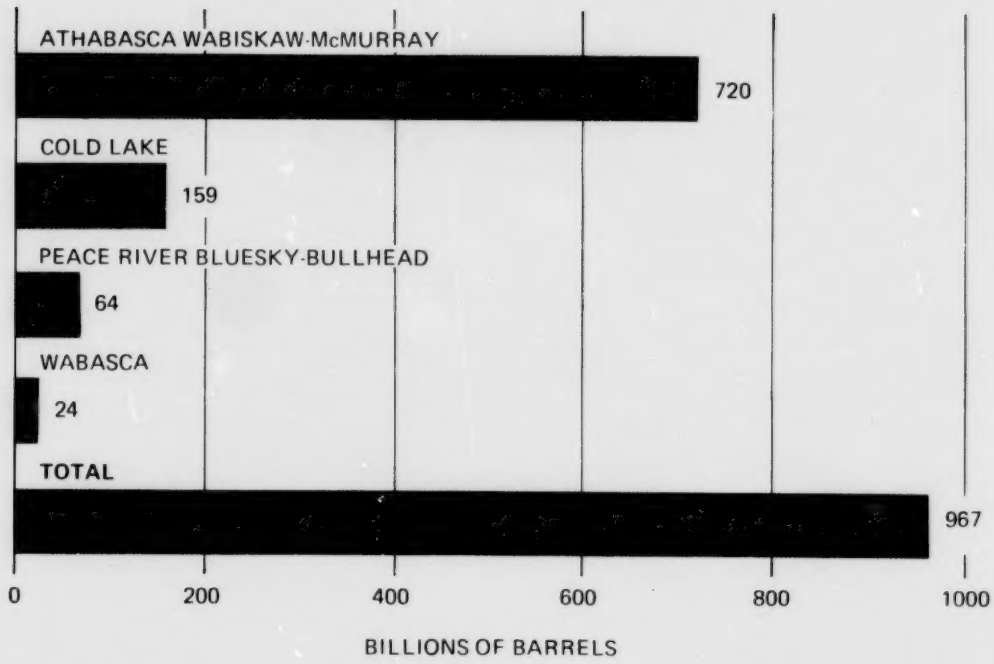


FIGURE 1. RESERVES OF CRUDE BITUMEN IN-PLACE IN THE FOUR MAJOR CRETACEOUS OIL SANDS DEPOSITS

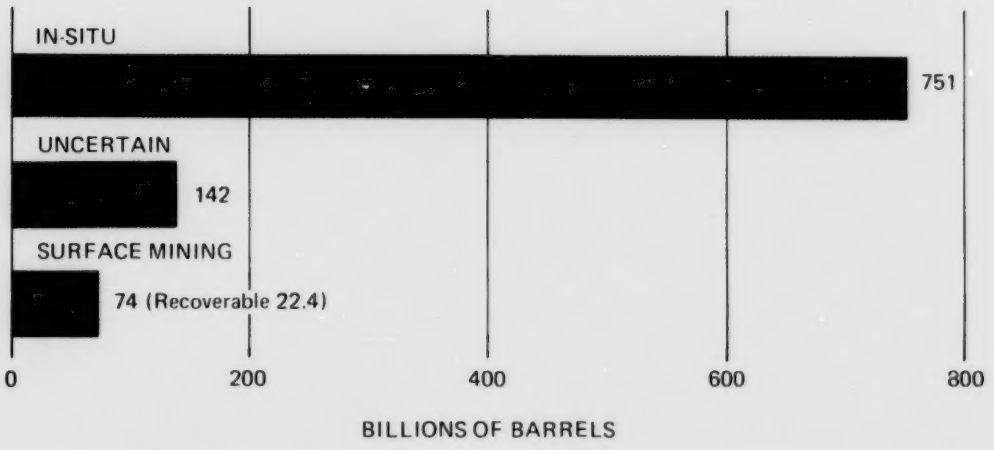
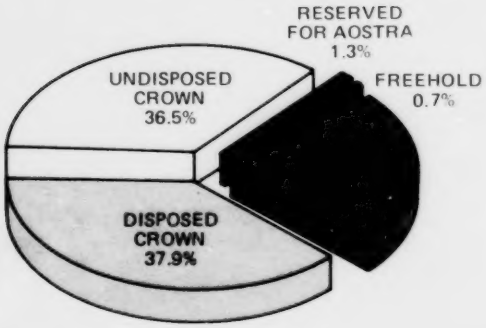


FIGURE 2. RESERVES OF CRUDE BITUMEN IN-PLACE, ATTRIBUTABLE TO VARIOUS EXTRACTION METHODS

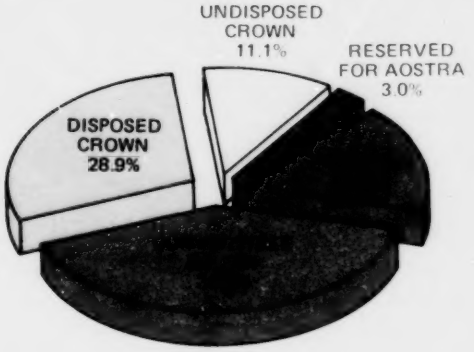
Table 1
LAND DISPOSITION IN MAJOR OIL SANDS DEPOSITS
(Acres)

TYPE OF DISPOSITION (% OF AREA OF INDIVIDUAL DEPOSIT)	ATHABASCA WABISKAW-McMURRAY	COLD LAKE	PEACE RIVER BLUESKY-BULLHEAD	WABASCA	TOTAL
DISPOSED CROWN OIL SANDS RIGHTS	4 137 881 (37.9)	810 605 (28.9)	340 436 (16.0)	347 016 (24.5)	5 635 938
UNDISPOSED CROWN RIGHTS	3 989 080 (36.5)	312 320* (11.1)	841 120 (39.6)	512 080 (36.2)	5 654 600
CONVERTIBLE PETROLEUM AND NATURAL GAS DISPOSITIONS	2 582 119 (23.6)	1 115 795 (39.8)	875 824 (41.3)	495 694 (35.0)	5 069 432
RESERVED FROM DISPOSITION (A.O.S.T.R.A.)	143 040 (1.3)	84 800 (3.0)	35 680 (1.7)	16 800 (1.2)	280 320
FREEHOLD	77 880 (0.7)	480 480 (17.2)	30 240 (1.4)	44 510 (3.1)	633 110
TOTAL DEPOSIT AREA (% OF AREA OF ALL DEPOSITS)	10 930 000 (63.3)	2 804 000 (16.2)	2 123 300 (12.3)	1 416 100 (8.2)	17 273 400

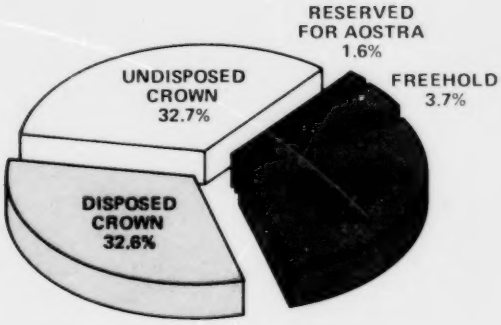
* Includes 28 800 acres in Cold Lake Air Weapons Range



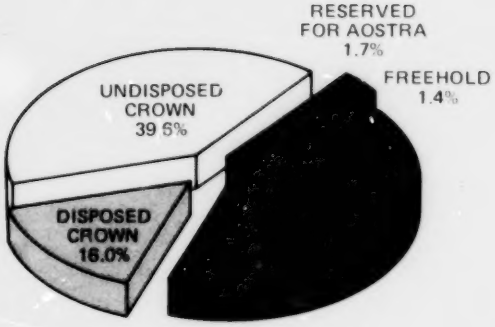
ATHABASCA
WABISKAW-McMURRAY
10 930 041 Acres



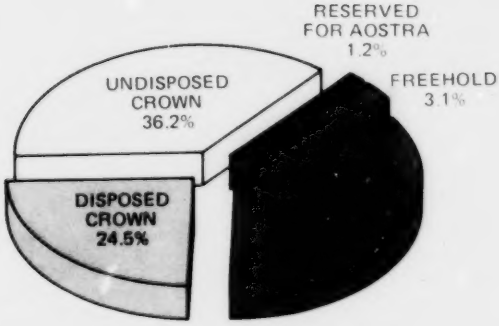
COLD LAKE
2 804 045 Acres



TOTAL
17 273 488 Acres

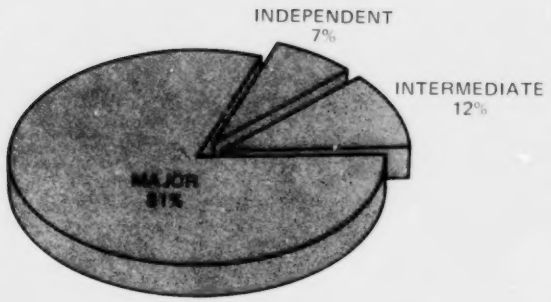


PEACE RIVER
BLUESKY-BULLHEAD
2 123 316 Acres

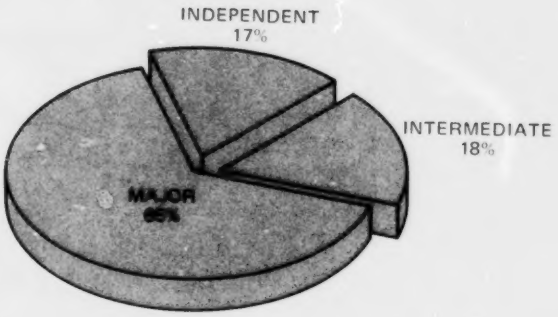


WABASCA
1 416 086 Acres

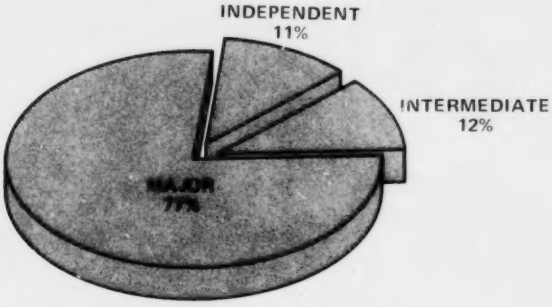
FIGURE 3. COMPARISON OF DISPOSITION OF CROWN AND FREEHOLD LANDS IN THE FOUR MAJOR CRETACEOUS OIL SANDS DEPOSITS



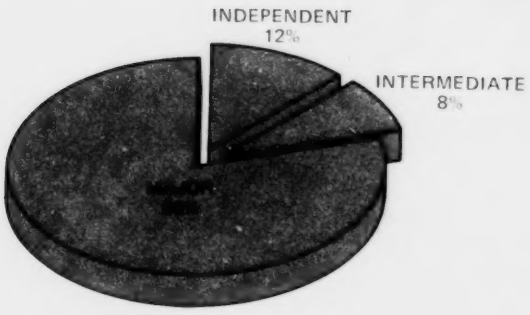
ATHABASCA
WABISKAW-McMURRAY
3 673 241 Acres



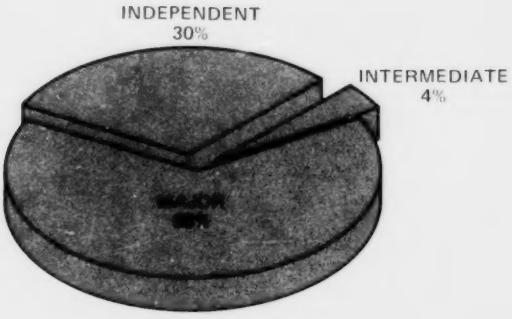
COLD LAKE
792 525 Acres



TOTAL
5 049 538 Acres



PEACE RIVER
BLUESKY-BULLHEAD
276 596 Acres



WABASCA
307 176 Acres

FIGURE 4. COMPARISON OF HOLDINGS OF CROWN LEASES BY MAJOR, INDEPENDENT AND INTERMEDIATE SIZE COMPANIES IN THE FOUR MAJOR CRETACEOUS OIL SANDS DEPOSITS

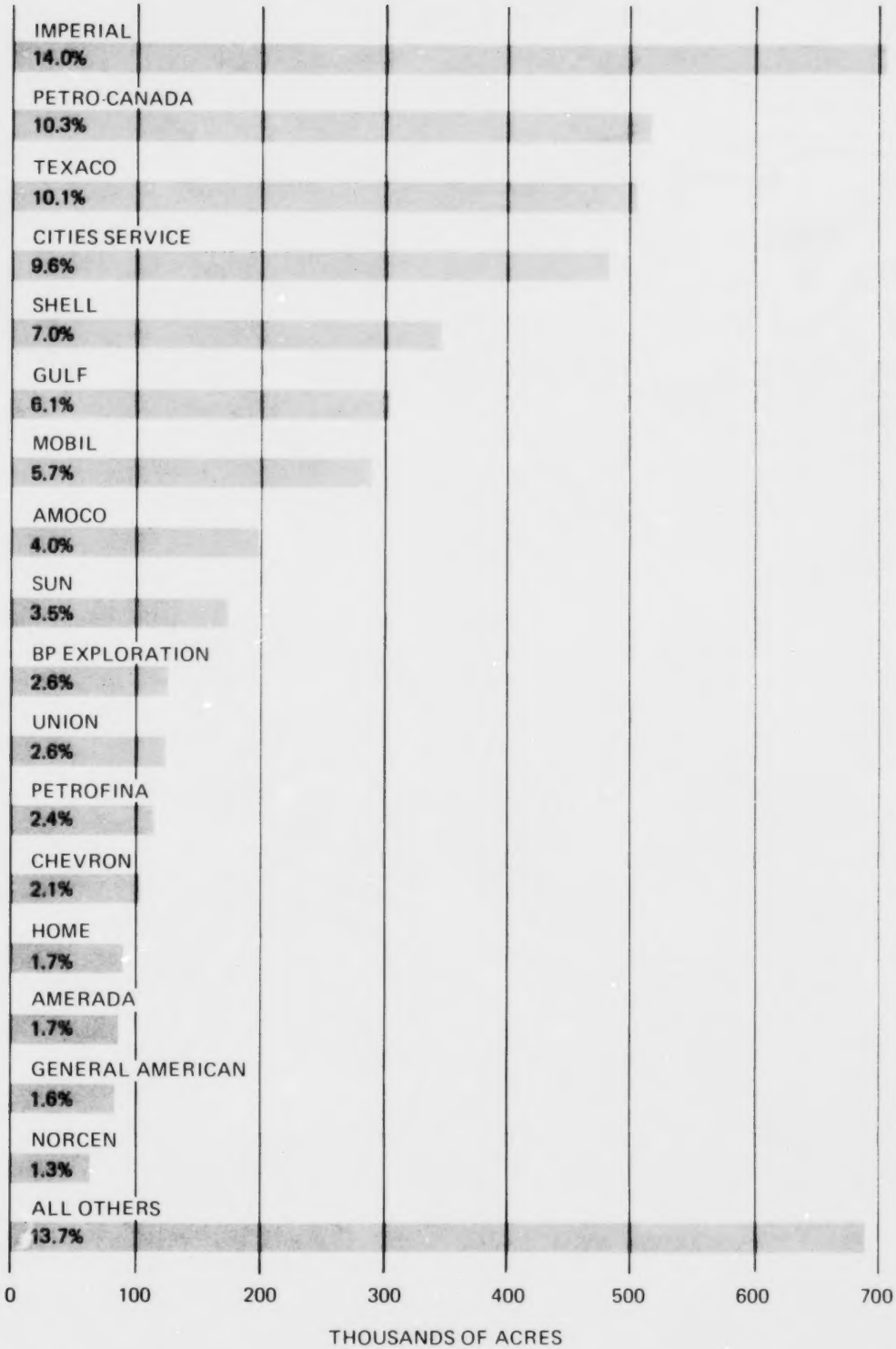


FIGURE 5. COMPARISON OF HOLDINGS OF CROWN LEASES BY INDIVIDUAL COMPANIES IN THE FOUR MAJOR CRETACEOUS OIL SANDS DEPOSITS

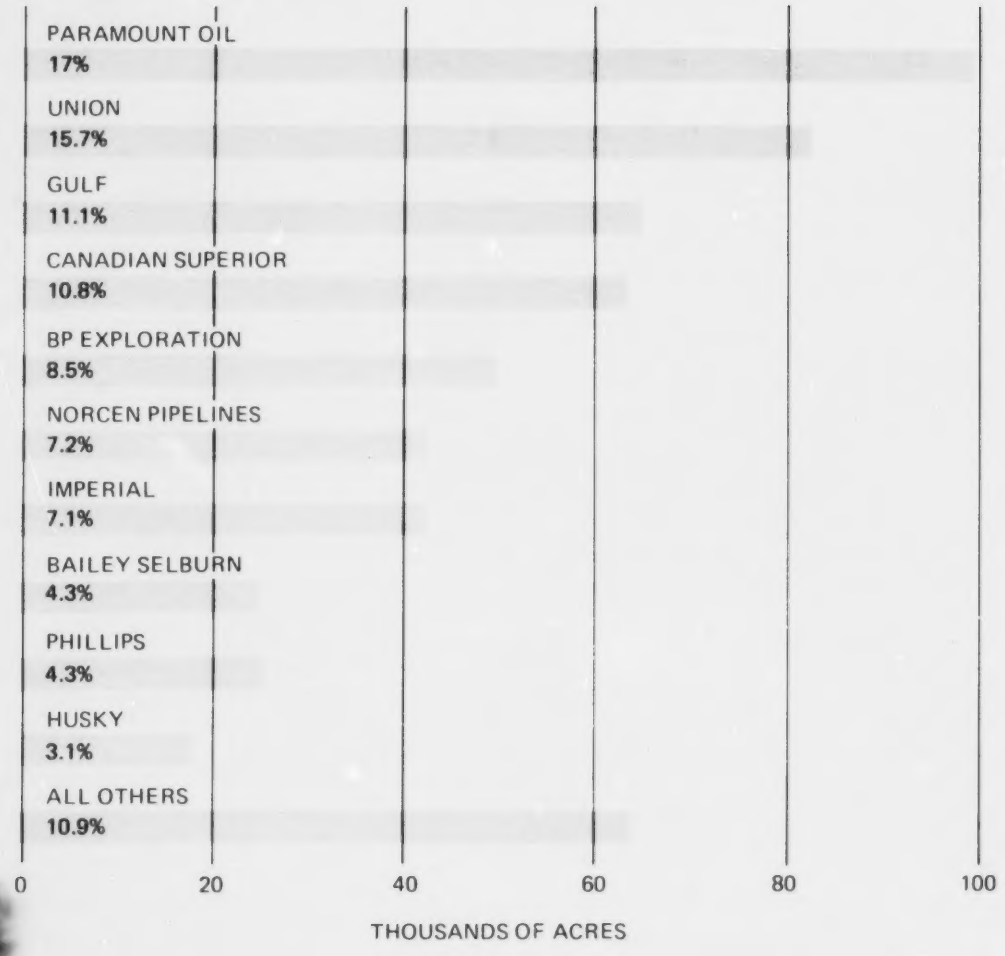


FIGURE 6. COMPARISON OF HOLDINGS OF CROWN OIL SANDS PROSPECTING PERMITS BY INDIVIDUAL COMPANIES IN THE FOUR MAJOR CRETACEOUS OIL SANDS DEPOSITS

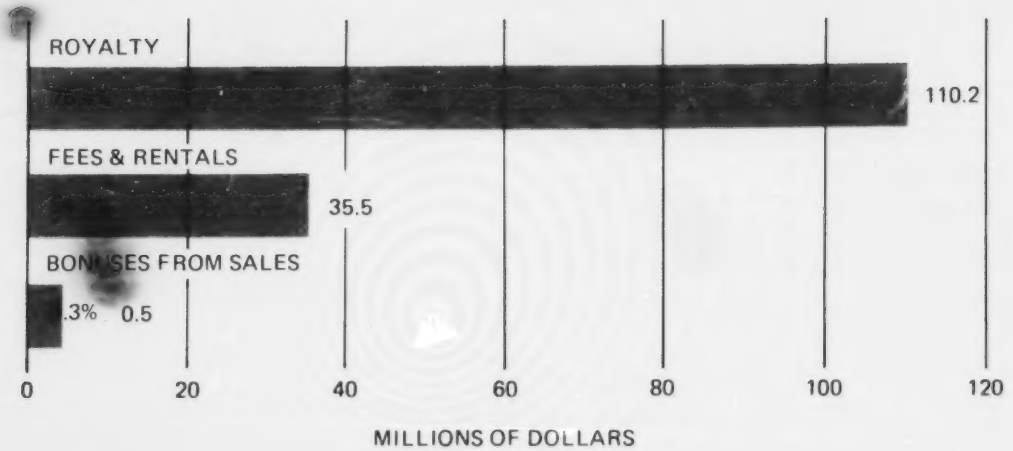


FIGURE 7. COMPARISON OF ALBERTA GOVERNMENT REVENUE DERIVED FROM ROYALTIES, FEES AND RENTALS AND BONUSES FROM SALES FROM ALL DEPOSITS OF OIL SANDS

ATHABASCA WABISKAW-McMURRAY

THE ATHABASCA WABISKAW–McMURRAY OIL SANDS DEPOSIT

The Athabasca oil sands deposit is the largest in Alberta. The evaluated area contains some 10.9 million acres, but the Energy Resources Conservation Board consider only 9.6 million acres of this as having potential because some areas are known to be barren of bitumen. The deposit is contained in the McMurray Formation and the overlying Wabiskaw member of the Clearwater Formation. The McMurray Formation is Lower Cretaceous in age and consists of non-marine, conglomerate sands and shales underlain by Devonian carbonate rocks.

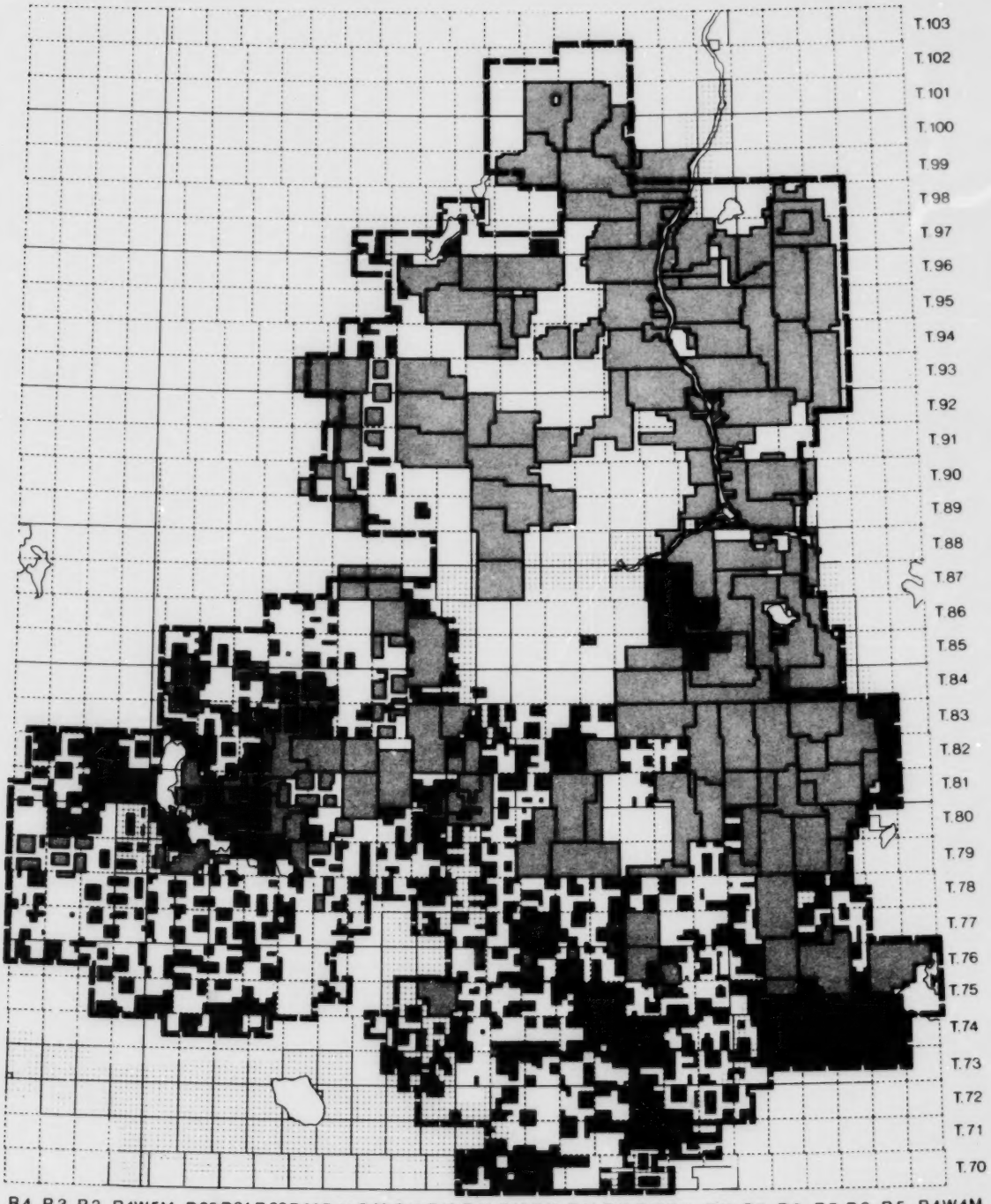
The deposit varies in depth from surface outcrops to beds overlain with more than 2500 feet of overburden of muskeg, glacial till, sandstones and shales. About 0.5 million acres of the deposit is overlain by 150 feet or less of overburden and is amenable to surface mining. The remaining 10.4 million acres of the deposit vary considerably in quality and are buried at such depths that the crude bitumen can only be recovered by an in-situ or some other method.

In-place reserves of crude bitumen in the evaluated area are estimated to be 720 billion barrels, of which 74 billion barrels are contained in the surface mineable interval to 150 feet. Of the surface mineable reserve, about 30.4 billion barrels are estimated to be initially recoverable after accounting for pit perimeter losses, mining reject (low grade ore) losses and extraction plant losses. The net yield of synthetic crude oil from that amount of crude bitumen is estimated to be 22.6 billion barrels with current technology.

In 1967, Great Canadian Oil Sands Limited started producing synthetic crude oil from a plant near Fort McMurray. It was the first plant built specifically to mine oil sands and the company pioneered many other developments. Approval was given recently to expand capacity to 65 000 barrels per day.

Syncrude Canada Limited built the second plant in the Athabasca deposit to mine the oil sands. First production occurred in 1978 toward the design capacity of 103 000 barrels per day. Recently, the Alsands Project Group announced plans to develop the third mining project capable of producing 140 000 barrels per day of synthetic crude oil.

At the end of 1978, companies held 3 673 241 acres in bituminous and oil sands leases and an additional 464 640 acres of Oil Sands Prospecting Permits in the deposit. In recent years companies have tended to be more selective in their holdings by retaining higher grade lands. This explains why considerable areas of the deposit exist as undisposed Crown rights.



MAP 2. DISPOSITION OF LANDS IN THE EVALUATED AREA OF THE ATHABASCA WABISKAW-McMURRAY DEPOSIT

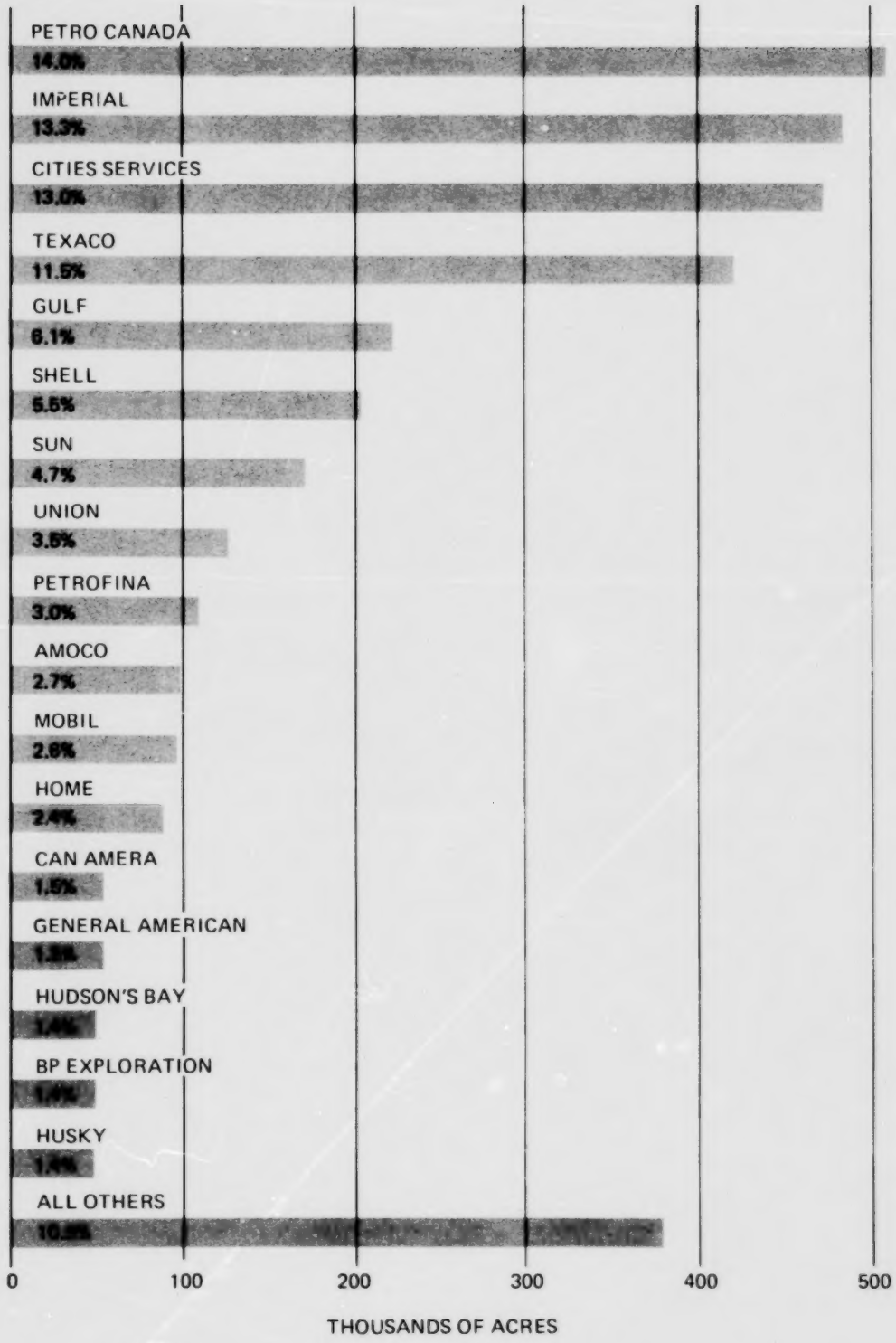


FIGURE 8. COMPARISON OF HOLDINGS OF CROWN LEASES BY INDIVIDUAL COMPANIES IN THE ATHABASCA WABISKAW-McMURRAY DEPOSIT

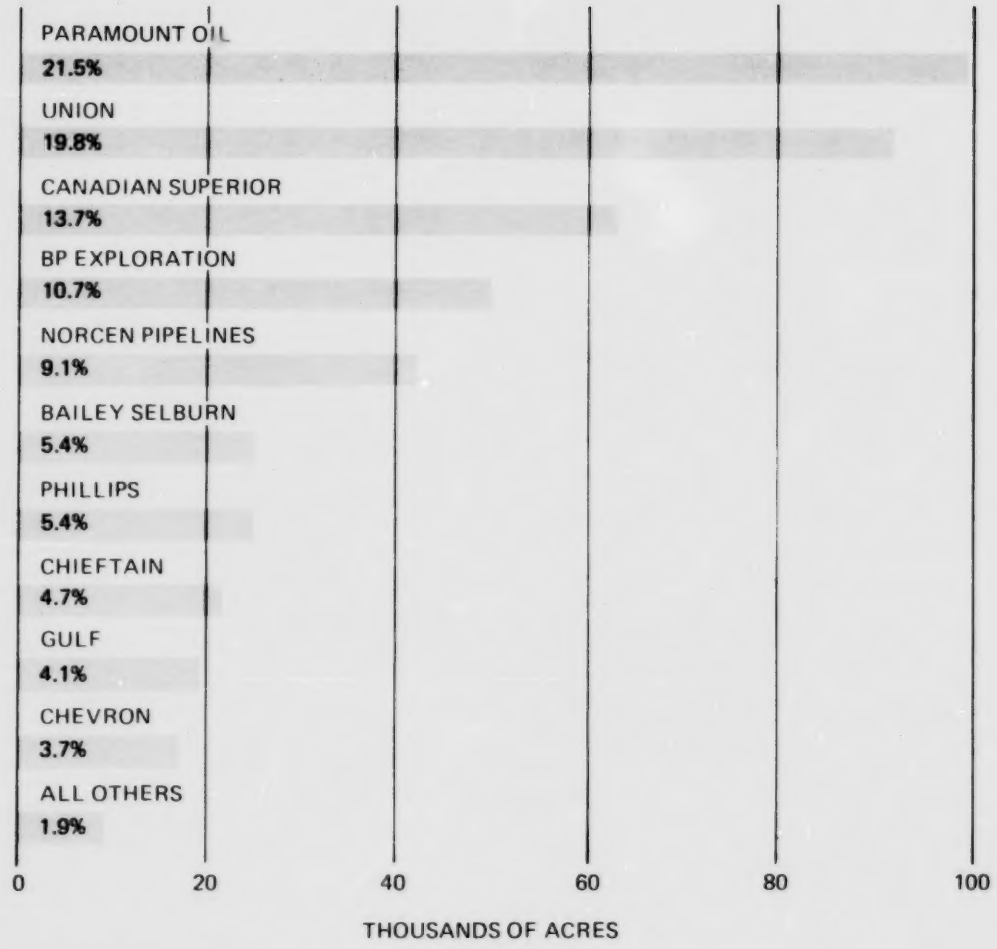


FIGURE 9. COMPARISON OF HOLDINGS OF CROWN OIL SANDS PROSPECTING PERMITS BY INDIVIDUAL COMPANIES IN THE ATHABASCA WABISKAW-McMURRAY DEPOSIT

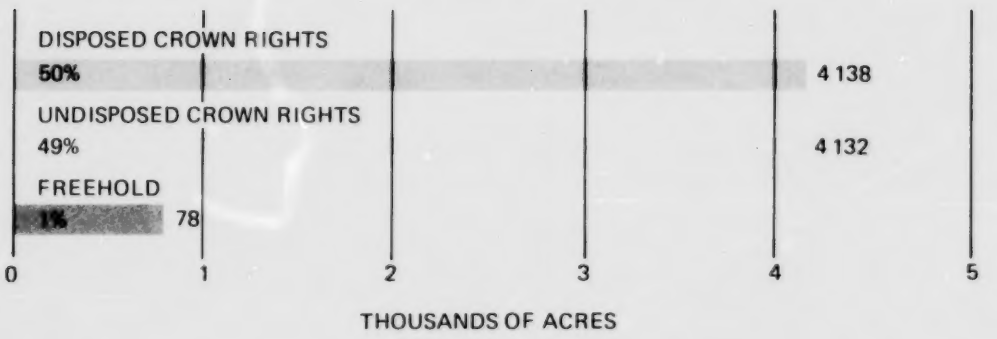


FIGURE 10. COMPARISON OF DISPOSED CROWN RIGHTS, UNDISPOSED CROWN RIGHTS AND FREEHOLD ACREAGE IN THE ATHABASCA WABISKAW-McMURRAY DEPOSIT

Table 2
DISPOSITION OF OIL AND BITUMINOUS SANDS LEASES IN THE ATHABASCA WABISKAW–McMURRAY OIL SANDS DEPOSITS

COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	%	Interest Acres	Issue/Expiry Date		Lease Number	Acres	%	Interest Acres	Issue/Expiry Date		Gross	Net
Amerada Minerals Corporation of Canada Ltd.	88	28 438	100	28 438	'67	'88								
	89	14 937	100	14 937	'67	'88								
	90	2 916	100	2 916	'67	'88								
TOTAL		46 291		46 291									46 291	46 291
Amoco Canada Petroleum Company Ltd.	73	49 935	100	49 935	'61	'82								
	76	49 833	100	49 833	'61	'82								
TOTAL		99 768		99 768									99 768	99 768
Aquitaine Company of Canada Ltd.	39	49 743	50	24 871	'60	'81							49 743	24 871
Bailey Selburn Oil & Gas Ltd.	19	18 758	50	9 379	'58	'79	0977090001	11 520	50	5 760	'77	'98		
	20	13 657	50	6 828	'58	'79								
	42	21 729	100	21 729	'60	'81								
TOTAL		54 144		37 936				11 520		5 760			65 664	43 696
Bow Valley Industries Ltd.	6677040003	6 400	33.33	2 134	'77	'98							6 400	2 134
BP Exploration Canada Limited	24	49 941	100	49 941	'59	'80							49 941	49 941
Brascan Resources Limited	39	49 743	30	14 923	'60	'81							49 743	14 923
Canada-Cities Service, Ltd.	17	48 265	22	10 618	'58	'79	2	49 403	25	12 351	'61	'82		
	22	49 591	22	10 910	'59	'80	3	16 481	25	4 210	'61	'82		

COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Gross	Net
Canada-Cities Service, Ltd. cont'd	29	49 722	30	14 917	'59	'80	4	49 402	33.33	16 467	'61	'82		
	31	49 870	30	14 961	'59	'80	5	49 403	33.33	16 468	'61	'82		
	32	11 365	30	3 410	'59	'80	6	49 362	33.33	16 454	'61	'82		
	40	22 054	30	6 616	'59	'80	7	30 529	33.33	10 176	'61	'82		
	41	18 491	30	5 547	'60	'81	8	19 457	33.33	6 486	'61	'82		
	54	49 483	33.33	16 494	'60	'81	9	49 411	33.33	16 470	'61	'82		
	55	26 001	33.33	8 667	'60	'81	10	27 257	33.33	9 086	'61	'82		
	56	23 377	33.33	7 792	'60	'81	11	7 768	33.33	2 589	'61	'82		
	57	49 451	33.33	16 484	'60	'81	12	20 123	33.33	6 708	'61	'82		
	58	36 041	33.33	12 014	'60	'81	13	11 666	33.33	3 889	'61	'82		
	59	45 414	33.33	15 138	'60	'81	14	39 010	33.33	13 003	'61	'82		
	60	31 250	33.33	10 417	'60	'81	15	41 610	33.33	13 870	'61	'82		
	61	26 642	33.33	8 881	'60	'81	16	49 435	33.33	16 478	'61	'82		
	63	43 562	33.33	14 521	'60	'81	17	15 544	33.33	5 181	'61	'82		
	65	49 467	33.33	16 489	'61	'82	18	46 802	33.33	15 600	'61	'82		
	66	49 419	33.33	16 473	'61	'82	(1) 19	13 930	33.33	4 643	'61	'82		
	70	46 802	33.33	15 600	61	'82								
	71	36 492	33.33	12 164	'61	'82								
	72	41 618	33.33	13 873	'61	'82								
	78	36 086	30	10 826	'61	'82								
	79	27 265	33.33	9 088	'61	'82								
	81	41 954	33.33	13 985	'62	'83								
TOTAL		909 682		285 885				586 953		190 129			1 496 635	476 014
Canadian Homestead Oils Limited							0977070002	6 720	75	5 040	'77	'98	6 720	5 040
Canadian Rhoades Oil Ltd.	77	6 792	50	3 396	'61	'82							6 792	3 396
Canadian Superior Oil Ltd.	6677040003	6 400	33.33	2 133	'77	'98	0977060004	17 280	100	17 280	'77	'98	23 680	19 413

(1) This lease contains an additional 23 040 acres (7 680 interest acres) in the presently established limits of the Wabasca deposits.

COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Gross	Net
Can-Amera Export Refining Company Limited	43	49 784	100	49 784	'60	'81								
	0876120001	5 873	100	5 873	'77	'98								
TOTAL		55 657		55 657									55 657	55 657
Castle Oil and Gas Limited							0977070002	6 720	25	1 680	'77	'98	6 720	1 680
CDC Oil & Gas Limited	87	49 427	51	25 208	'66	'87							49 427	25 208
Chevron Canada Limited	23	36 646	100	36 646	'59	'80							36 646	36 646
Cavalier Energy Inc.	6677040003	6 400	33.33	2 133	'77	'98							6 400	2 133
Esso Resources Canada Limited	17	48 265	31.25	15 083	'58	'79	2	49 403	25	12 350	'61	'82		
	22	49 591	31.25	15 497	'59	'80	3	16 841	25	4 211	'61	'82		
	29	49 722	30	14 917	'59	'80	4	49 402	33.33	16 468	'61	'82		
	31	49 870	30	14 961	'59	'80	5	49 403	33.33	16 467	'61	'82		
	32	11 365	30	3 410	'59	'80	6	49 362	33.33	16 454	'61	'82		
	40	22 054	30	6 616	'59	'80	7	30 529	33.33	10 177	'61	'82		
	41	18 491	30	5 547	'60	'81	8	19 457	33.33	6 485	'61	'82		
	54	49 483	33.33	16 495	'60	'81	9	49 411	33.33	16 471	'61	'82		
	55	26 001	33.33	8 667	'60	'81	10	27 257	33.33	9 085	'61	'82		
	56	23 377	33.33	7 792	'60	'81	11	7 768	33.33	2 590	'61	'82		
	57	49 451	33.33	16 483	'60	'81	12	20 123	33.33	6 707	'61	'82		
	58	36 041	33.33	12 014	'60	'81	13	11 666	33.33	3 888	'61	'82		
	59	45 414	33.33	15 138	'60	'81	14	39 010	33.33	13 004	'61	'82		
	60	31 250	33.33	10 417	'60	'81	15	41 610	33.33	13 870	'61	'82		
	61	26 642	33.33	8 880	'60	'81	16	49 435	33.33	16 479	'61	'82		
	63	43 562	33.33	14 521	'60	'81	17	15 544	33.33	5 181	'61	'82		

COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Gross	Net
Esso Resources Canada Limited cont'd	65	49 467	33.33	16 489	'61	'82	18	46 802	33.33	15 601	'61	'82		
	66	49 419	33.33	16 473	'61	'82	(1) 19	13 930	33.33	4 643	'61	'82		
	70	46 802	33.33	15 601	'61	'82								
	71	36 492	33.33	12 164	'61	'82								
	72	41 618	33.33	13 872	'61	'82								
	78	36 086	30	10 825	'61	'82								
	79	27 265	33.33	9 089	'61	'82								
	81	41 954	33.33	13 984	'62	'83								
TOTAL		909 682		294 935				586 953		190 131			1 496 635	485 066
General American Oils, Ltd.							0977020001	30 720	100	30 720	'77	'98		
							(2) 0978030002	23 040	100	23 040	'78	'99		
TOTAL								53 760		53 760			53 760	53 760
Government of Canada	17	48 265	15	7 240	'58	'79								
	22	49 591	15	7 439	'59	'80								
TOTAL		97 856		14 679									97 856	14 679
Great Canadian Oil Sands Limited	17A	1 527	100	1 527	'58	'79								
	23A	291	100	291	'59	'80								
	0877060001	4 177	100	4 177	'77	'98								
TOTAL		5 995		5 995									5 995	5 995
Gulf Oil Canada Limited	17	48 265	16.75	8 085	'58	'79	38	46 803	100	46 803	'68	'89		
	22	49 591	16.75	8 306	'59	'80	71	42 923	100	42 923	'74	'95		
	29	49 722	10	4 972	'59	'80	72	37 050	100	37 050	'74	'95		
	31	49 870	10	4 987	'59	'80	90	39 002	100	39 002	'76	'97		
	32	11 365	10	1 136	'59	'80	0977040001	23 040	100	23 040	'77	'98		
	40	22 054	10	2 206	'59	'80								
	41	18 491	10	1 849	'60	'81								
	78	36 086	10	3 609	'61	'82								
TOTAL		285 444		35 150				188 818		188 818			474 262	223 968

(1) This lease contains an additional 23040 acres (7680 interest acres) in the presently established limits of the Wabasca deposits.

(2) This lease containes an additional 15 360 acres in the presently established limits of the Wabasca deposit.

COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	%	Interest Acres	Issue/Expiry Date		Lease Number	Acres	%	Interest Acres	Issue/Expiry Date		Gross	Net
Home Oil Company Limited	30	37 715	100	37 715	'59	'80	59	49 907	100	49 907	'70	'91	87 622	87 622
Hudson's Bay Oil and Gas Company Limited	18	49 969	100	49 969	'58	'79							49 969	49 969
Husky Oil Ltd.	35	49 904	100	49 904	59	'80							49 904	49 904
Kaiser Resources Ltd.	19	18 758	50	9 379	'58	'79								
	20	13 657	50	6 829	'58	'79								
TOTAL		32 415		16 208									32 415	16 208
Mobil Oil Canada, Ltd.	16	5 824	100	5 824	'58	'79								
	21	2 584	100	2 584	'59	'80								
	36	12 156	100	12 156	'60	'81								
	37	49 751	100	49 751	'60	'81								
	38	26 340	100	26 340	'60	'81								
TOTAL		96 655		96 655									96 655	96 655
Norcen Energy Resources Limited	39	49 743	20	9 949	'60	'81							49 743	9 949
Norcen Pipelines Ltd.							0977060002	6 400	100	6 400	'77	'98	6 400	6 400
Ontario Energy Corporation	29	49 722	5	2 486	'59	'80								
	31	49 870	5	2 494	'59	'80								
	32	11 365	5	568	'59	'80								
	40	22 054	5	1 103	'59	'80								
	41	18 491	5	925	'60	'81								
	78	36 086	5	1 804	'61	'82								
TOTAL		187 588		9 380									187 588	9 380

COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Gross	Net
PanCanadian Petroleum Limited	17	48 265	5	2 413	'58	'79								
	22	49 591	5	2 480	'59	'80								
TOTAL		97 856		4 893									97 856	4 893
Petro-Canada Exploration Inc.	29	49 722	15	7 458	'59	'80	2	49 403	25	12 351	'61	'82		
	31	49 870	15	7 480	'59	'80	3	16 841	25	4 210	'61	'82		
	32	11 365	15	1 705	'59	'80	4	49 402	33.33	16 467	'61	'82		
	40	22 054	15	3 308	'59	'80	5	49 403	33.33	16 468	'61	'82		
	41	18 491	15	2 774	'60	'81	6	49 362	33.33	16 454	'61	'82		
	52	35 109	100	35 109	'60	'81	7	30 529	33.33	10 176	'61	'82		
	54	49 483	33.33	16 494	'60	'81	8	19 457	33.33	6 486	'61	'82		
	55	26 001	33.33	8 667	'60	'81	9	49 411	33.33	16 470	'61	'82		
	56	23 377	33.33	7 793	'60	'81	10	27 257	33.33	9 086	'61	'82		
	57	49 451	33.33	16 484	'60	'81	11	7 768	33.33	2 589	'61	'82		
	58	36 041	33.33	12 013	'60	'81	12	20 123	33.33	6 708	'61	'82		
	59	45 414	33.33	15 138	'60	'81	13	11 666	33.33	3 889	'61	'82		
	60	31 250	33.33	10 416	'60	'81	14	39 010	33.33	13 003	'61	'82		
	61	26 642	33.33	8 881	'60	'81	15	41 610	33.33	13 870	'61	'82		
	63	43 562	33.33	14 520	'60	'81	16	49 435	33.33	16 478	'61	'82		
	65	49 467	33.33	16 489	'61	'82	17	15 544	33.33	5 182	'61	'82		
	66	49 419	33.33	16 473	'61	'82	18	46 802	33.33	15 601	'61	'82		
	70	46 802	33.33	15 601	'61	'82	(1) 19	13 930	33.33	4 643	'61	'82		
	71	36 492	33.33	12 164	'61	'82								
	72	41 618	33.33	13 873	'61	'82								
	74	23 353	100	23 353	'61	'82								
	75	25 945	100	25 945	'61	'82								
	78	36 086	15	5 413	'61	'82								
	79	27 265	33.33	9 088	'61	'82								
	81	41 954	33.33	13 985	'62	'83								
TOTAL		896 233		320 624				586 953		190 131			1 483 186	510 755

(1) This lease contains an additional 23040 acres (7680 interest acres) in the presently established limits of the Wabasca deposits.

COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	%	Interest Acres	Issue/Expiry Date		Lease Number	Acres	%	Interest Acres	Issue/Expiry Date		Gross	Net
Petrofina Canada Ltd.	33	22 701	100	22 701	'59	'80	[3] 0978020001	5 120	100	5 120	'78	'99		
	34	9 129	100	9 129	'59	'80								
	82	48 589	100	48 589	'62	'83								
	92	1 393	100	1 393	'75	'96								
	93	2 859	100	2 859	'76	'97								
	94	6 460	100	6 460	'76	'97								
	95	5 608	100	5 608	'76	'97								
	96	4 174	100	4 174	'76	'97								
	97	2 483	100	2 483	'76	'97								
TOTAL		103 396		103 396				5 120		5 120			108 516	108 516
Phillips Petroleum Company Western Hemisphere							0977090001	11 520	50	5 760	'77	'98	11 520	5 760
Placer Cego Petroleum Limited							[4] 0978100001	2 094	100	2 094	'78	'99	2 094	2 094
Province of Alberta	17	48 265	10	4 826	'58	'79								
	22	49 591	10	4 959	'59	'80								
	29	49 722	10	4 972	'59	'80								
	31	49 870	10	4 987	'59	'80								
	32	11 365	10	1 136	'59	'80								
	40	22 054	10	2 205	'59	'80								
	41	18 491	10	1 849	'60	'81								
	78	36 086	10	3 609	'61	'82								
TOTAL		285 444		28 543									285 444	28 543
Shell Canada Resources Limited (50%) and Shell Explorer Limited (50%)	0877080001	49 872	100	49 872	'77	'98								
	26	15 665	100	15 665	'59	'80								
	28	35 094	100	35 094	'59	'80								

[3] This lease is outside presently established limits of Athabasca Wabiskaw-McMurray deposit.

[4] 640 acres of this lease is outside presently established limits of Athabasca Wabiskaw-McMurray deposit.

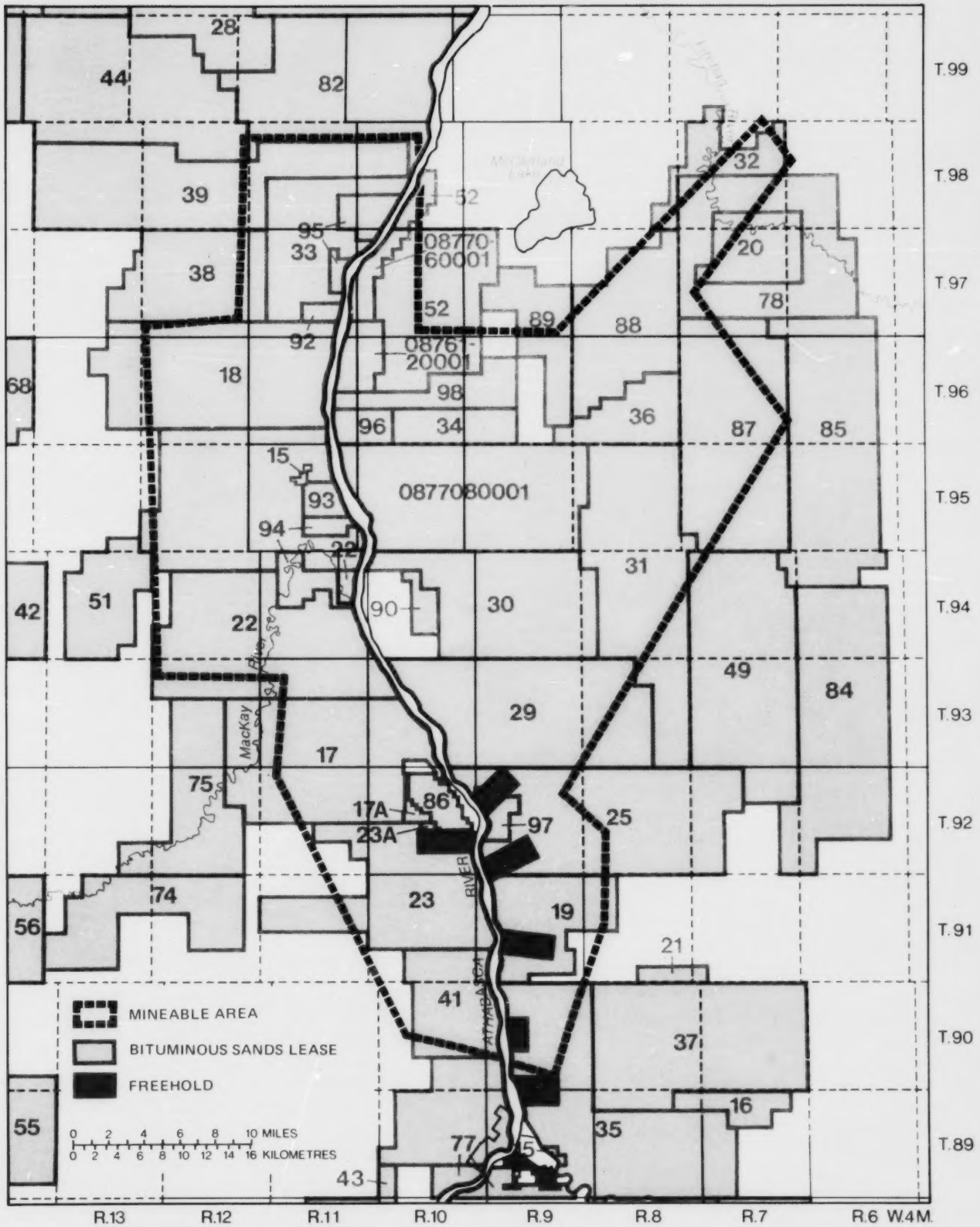
COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	%	Interest Acres	Issue/Expiry Date		Lease Number	Acres	%	Interest Acres	Issue/Expiry Date		Gross	Net
Shell Canada Resources Limited (50%) and Shell Explorer Limited (50%)	42A	16 209	100	16 209	'60	'81								
	45	34 418	100	34 418	'60	'81								
TOTAL	53	49 418	100	49 418	'60	'81								
		200 676		200 676									200 676	200 676
Siebens Oil and Gas Ltd.														
							[5] 0978060001	20 480	100	20 480	'78	'99	20 480	20 480
Sun Oil Company Limited	27	49 994	100	49 994	'59	'80								
	84	49 378	100	49 378	'64	'85								
	85	49 419	100	49 419	'64	'85								
	86	4 522	100	4 522	'66	'87								
TOTAL	98	11 227	100	11 227	'76	'97								
		164 540		164 540									164 540	164 540
Tenneco Oil of Canada Ltd.	87	49 427	49	24 219	'66	'87							49 427	24 219
Texaco Canada Inc.	44	49 775	100	49 775	'60	'81	75	6 400	50	3 200	'75	'96		
	46	49 751	100	49 751	'60	'81	0977060001	19 520	100	19 520	'77	'98		
	47	49 735	100	49 735	'60	'81								
	48	49 763	100	49 763	'60	'81								
	49	49 727	100	49 727	'60	'81								
	51	52 043	100	52 043	'60	'81								
	67	25 969	100	25 969	'61	'82								
	68	46 154	100	46 154	'61	'82								
TOTAL	69	23 377	100	23 377	'61	'82								
		396 294		396 294				25 920		22 720			422 214	419 014
Texaco Canada Limited							75	6 400	50	3 200	'75	'96	6 400	3 200

[5] This lease is outside presently established limits of Athabasca Wabiskaw-McMurray deposit.

COMPANY	BITUMINOUS SANDS LEASES						OIL SANDS LEASES						TOTAL ACRES	
	Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date		Gross	Net
Total Petroleum (North America) Ltd.	50	32 824	100	32 824	'60	'81							32 824	32 824
Union Oil Company Limited	25	49 964	100	49 964	'59	'80	2	49 403	25	12 351	'61	'82		
							3	16 841	25	4 210	'61	'82		
							(6) 0978030001	38 400	100	38 400	'78	'99		
							(7) 0978050001	23 040	100	23 040	'78	'99		
TOTAL		49 964		49 964				127 684		78 001			177 648	127 965
Wood Oil Company	77	6 792	50	3 396	'61	'82							6 792	3 396
ALL COMPANIES (INTEREST ACRES)				2 636 830						1 036 411				3 673 241

(6) This lease is outside presently established limits of Athabasca Wabiskaw-McMurray deposit.

(7) 11 520 acres of this lease are outside presently established limits of the Athabasca Wabiskaw-McMurray deposit.



MAP 3. DISPOSITION OF BITUMINOUS SANDS LEASES IN THE SURFACE MINEABLE AREA OF THE ATHABASCA WABISKAW-McMURRAY DEPOSIT

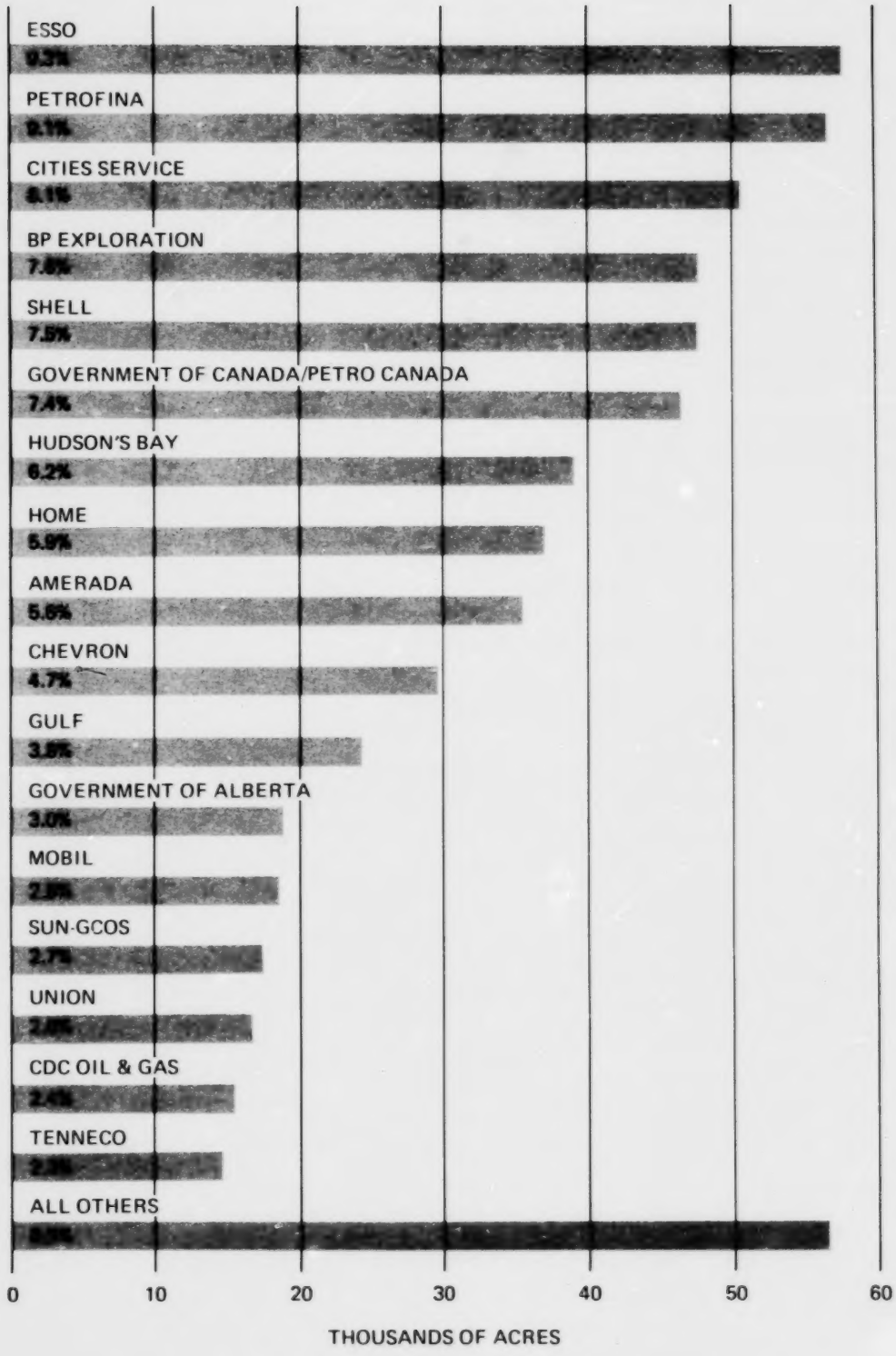


FIGURE 11. COMPARISON OF HOLDINGS OF CROWN BITUMINOUS SANDS LEASES BY INDIVIDUAL COMPANIES IN THE SURFACE MINEABLE AREA OF THE ATHABASCA WABISKAW-McMURRAY DEPOSIT

Table 3
DISPOSITION OF LAND BY METHOD OF EXTRACTION
– ATHABASCA WABISKAW-McMURRAY DEPOSIT
(Acres)

METHOD OF EXTRACTION (% OF TOTAL AREA)	SURFACE MINEABLE (OVERBURDEN LESS THAN 150')	TECHNOLOGY UNCERTAIN (OVERBURDEN 150' to 499')	POTENTIAL IN-SITU (OVERBURDEN GREATER THAN 500')	TOTAL
DISPOSED CROWN OIL SANDS RIGHTS	630 000 (92)	603 000 (60)	3 048 000 (33)	4 281 000
UNDISPOSED CROWN RIGHTS	48 000 (7)	405 000 (40)	3 536 000 (38)	3 989 000
CONVERTIBLE CROWN RIGHTS	– – – – – –	– – – – – –	2 582 000 (28)	2 582 000
FREEHOLD	10 000 (1)	2 000 Negl.	66 000 (1)	78 000
TOTAL AREA	688 000	1 010 000	9 232 000	*10 930 000

* Some 1 300 000 acres of this are considered to be barren of bitumen

COLD LAKE

THE COLD LAKE OIL SANDS DEPOSITS

The Cold Lake oil sands are made up of four separate deposits each covered by overburden extending from 1000 feet to a depth of about 2000 feet.

The McMurray deposit is made up of discontinuous and sporadically distributed non-marine sandstone overlying Devonian formations, while the Clearwater deposit is a marine sandstone sequence, fairly continuous and massive. The Lower Grand Rapids deposit is made up of several non-marine sands of varying thickness, the uppermost sand is occasionally gas-bearing.

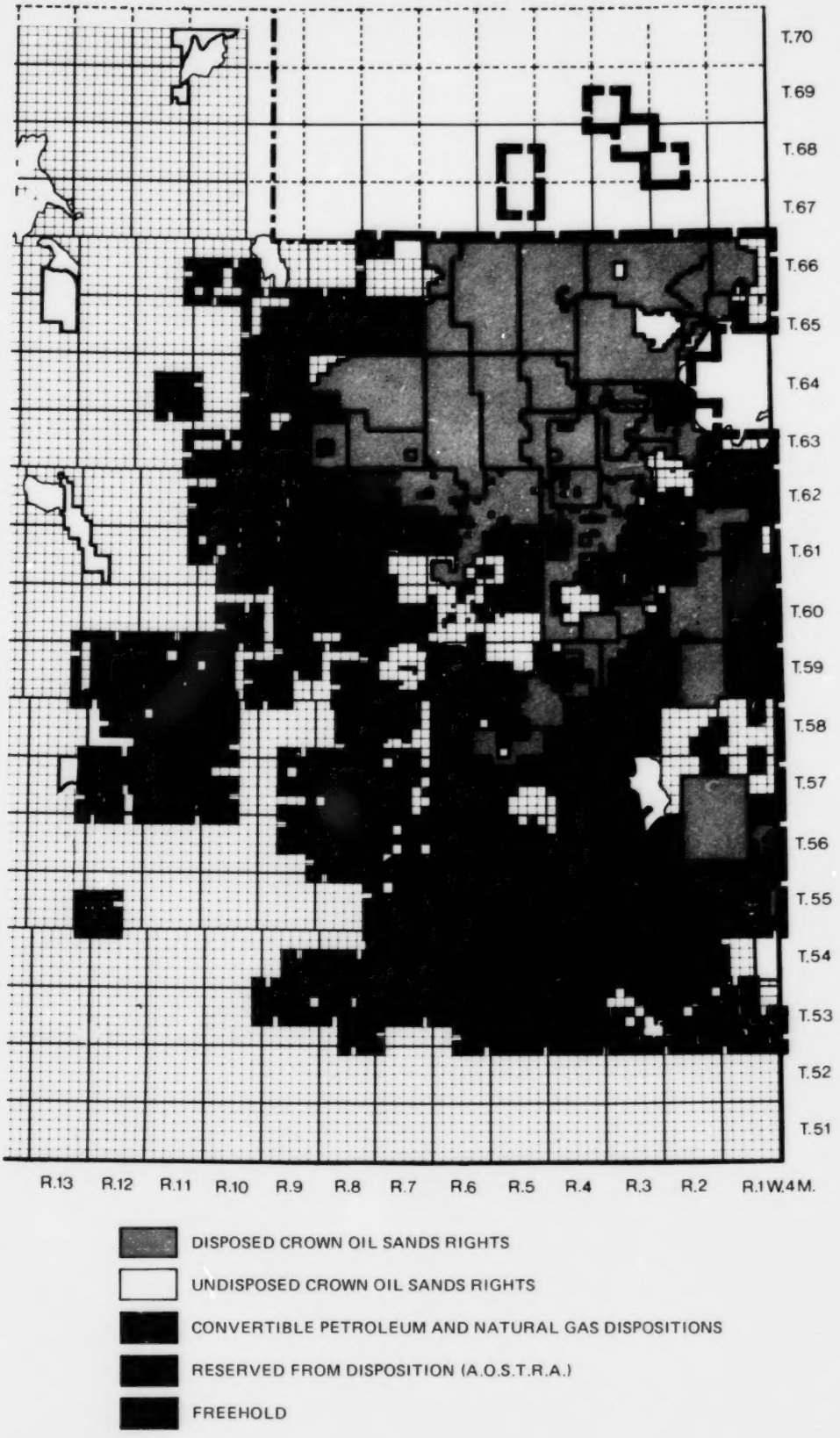
The richest oil sands in the Cold Lake deposits are found in the Clearwater and Grand Rapids Formations which contain reservoirs of more uniform grain size and thickness than the fresh water sediments of the Athabasca Wabiskaw-McMurray and Peace River reservoirs.

In-place reserves of crude bitumen in the evaluated area of the four deposits are estimated to be 159 billion barrels and no proved recoverable reserves have yet been assigned. The crude bitumen in these deposits is the least viscous of that found in any deposit in Alberta, but good reservoir communication is lacking and a method that causes fracturing of the formation may be necessary before commercial production can be attained.

An experimental scheme has been operating for 12 years at Cold Lake and is now waiting for approval for construction of permanent facilities to produce crude bitumen or derived products. The scheme would recover 160 000 barrels per day of crude bitumen which would be upgraded and treated to produce 141 000 barrels per day of synthetic crude oil.

The Cold Lake Air Weapons Range is being actively explored under the guidance of the Alberta Energy Company, owned jointly by the Alberta Government and shareholders, most of them Alberta citizens. An agreement with the Federal government was concluded previously to provide access to the lands which contain military equipment.

At the end of 1978, companies held 792 525 acres in oil sands leases and one Oil Sands Prospecting Permit containing 18 080 acres. Much of the available Crown lands at Cold Lake are under disposition and substantial amounts of freehold acreage are available. The relatively large amount of freehold property in these deposits is due to the fact they expand into the agricultural areas of the Province. That land was offered in the early days of the Province's history as an inducement to settlers.



MAP 4. DISPOSITION OF LANDS IN THE EVALUATED AREA OF THE COLD LAKE DEPOSITS

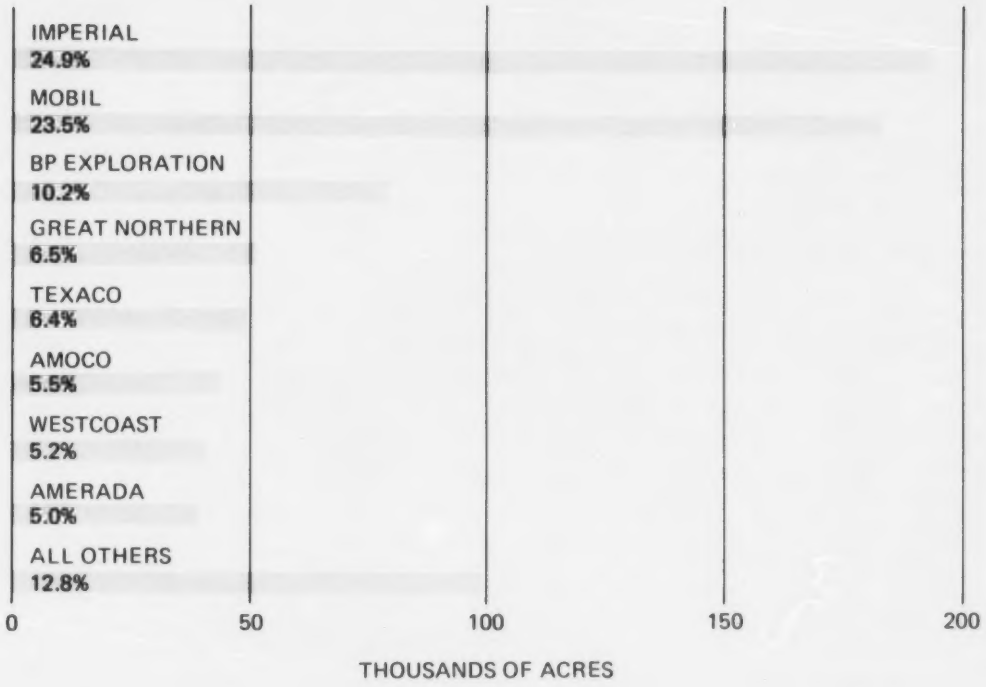


FIGURE 12. COMPARISON OF HOLDINGS OF CROWN LEASES BY INDIVIDUAL COMPANIES IN THE COLD LAKE DEPOSITS

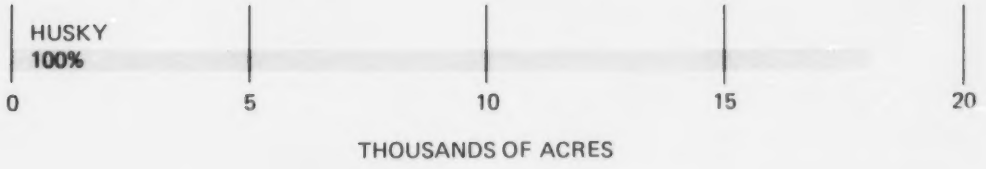


FIGURE 13. COMPARISON OF HOLDINGS OF CROWN OIL SANDS PROSPECTING PERMITS BY INDIVIDUAL COMPANIES IN THE COLD LAKE DEPOSITS

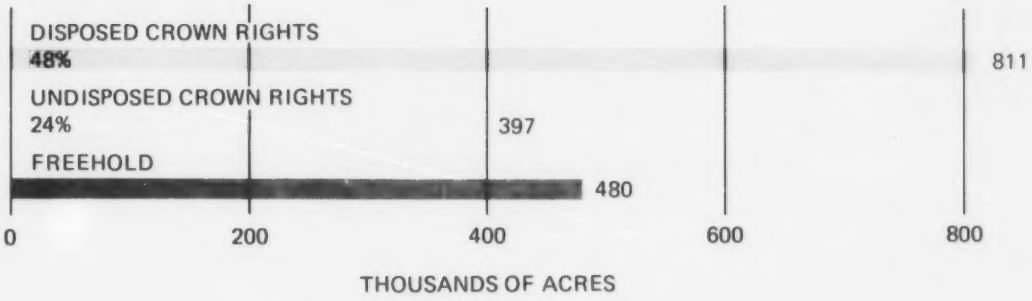


FIGURE 14. COMPARISON OF DISPOSED CROWN RIGHTS, UNDISPOSED CROWN RIGHTS AND FREEHOLD ACREAGE IN THE COLD LAKE DEPOSITS

Table 4
DISPOSITION OF OIL SANDS LEASES
IN THE COLD LAKE OIL SANDS DEPOSITS

COMPANY	OIL SANDS LEASES					
	Lease Number	Acres	Interest %	Acres	Issue/Expiry Date	
Amerada Minerals Corporation of Canada Ltd.	36	23 205	100	23 205	'67	'88
	50	11 016	100	11 016	'69	'90
	51	4 528	100	4 528	'69	'90
TOTAL		38 749		38 749		
Amoco Canada Petroleum Company Ltd.	33	14 613	100	14 613	'67	'88
	34	22 089	100	22 089	'67	'88
	0977040004	6 400	100	6 400	'77	'98
TOTAL		43 102		43 102		
Ashland Oil Canada Limited	78	1 600	100	1 600	'75	'96
Bailey Selburn Oil & Gas Ltd.	70	17 132	50	8 566	'74	'95
BP Exploration Canada Limited	54	15 885	22.5	3 574	'69	'90
	61	15 245	100	15 245	'71	'92
	62	10 848	100	10 848	'71	'92
	64	49 411	100	49 411	'72	'93
TOTAL		91 389		79 078		
Chevron Canada Limited	79	12 800	100	12 800	'75	'96
Great Northern Oil, Ltd	56	7 456	35	2 610	'69	'90
	57	7 784	35	2 724	'69	'90
	69	45 505	100	45 505	'74	'95
TOTAL		60 745		50 839		
Great Plains Development Company of Canada Limited	80	4 480	35	1 568	'75	'96
Gulf Oil Canada Limited	84	12 840	100	12 840	'76	'97
Hanna Oil Development Company	54	15 885	12.5	1 986	'69	'90
Hudson's Bay Oil and Gas Company Limited	77	7 680	100	7 680	'76	'97
Imperial Oil Limited	39	28 257	100	28 257	'68	'89

COMPANY	OIL SANDS LEASES					
	Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date	
Imperial Oil Limited cont'd	40	49 603	100	49 603	'68	'89
	41	49 705	100	49 705	'68	'89
	42	49 739	100	49 739	'68	'89
	49	16 192	100	16 192	'69	'90
TOTAL		193 496		193 496		
Lamont, Donald Breck	54	15 885	6	953	'69	'90
Mobil Oil Canada, Ltd.	45	46 470	100	46 470	'69	'90
	46	48 587	100	48 587	'69	'90
	47	38 002	100	38 002	'69	'90
	48	38 166	100	38 166	'69	'90
	58	11 508	100	11 508	'70	'91
TOTAL		182 733		182 733		
Murphy Oil Company Ltd.	0977120001	14 720	100	14 720	'77	'98
Norcen Energy Resources Limited	54	15 885	50	7 943	'69	'90
	60	16 393	100	16 393	'71	'92
TOTAL		32 278		24 336		
Pacific Petroleums Ltd.	70	17 132	50	8 566	'74	'95
Pan Ocean Oil Ltd.	54	15 885	1.5	238	'69	'90
Sun Oil Company Limited	53	4 220	100	4 220	'69	'90
Texaco Canada Inc.	52	40 909	100	40 909	'69	'90
	73	8 736	100	8 736	'75	'96
TOTAL		49 645		49 645		
Union Texas of Canada Ltd.	56	7 456	65	4 846	'69	'90
	57	7 784	65	5 060	'69	'90
TOTAL		15 240		9 906		
United Canso Oil & Gas Ltd.	54	15 885	7.5	1 191	'69	'90
Westcoast Petroleum Ltd	63	22 721	100	22 721	'72	'93
	0978030003	18 080	100	18 080	'78	'99
TOTAL		40 801		40 801		
Yellowknife Bear Mines Limited	80	4 480	65	2 912	'75	'96

ALL COMPANIES (INTEREST ACRES) 792 525

PEACE RIVER BLUESKY-BULLHEAD

THE PEACE RIVER BLUESKY – BULLHEAD OIL SANDS DEPOSIT

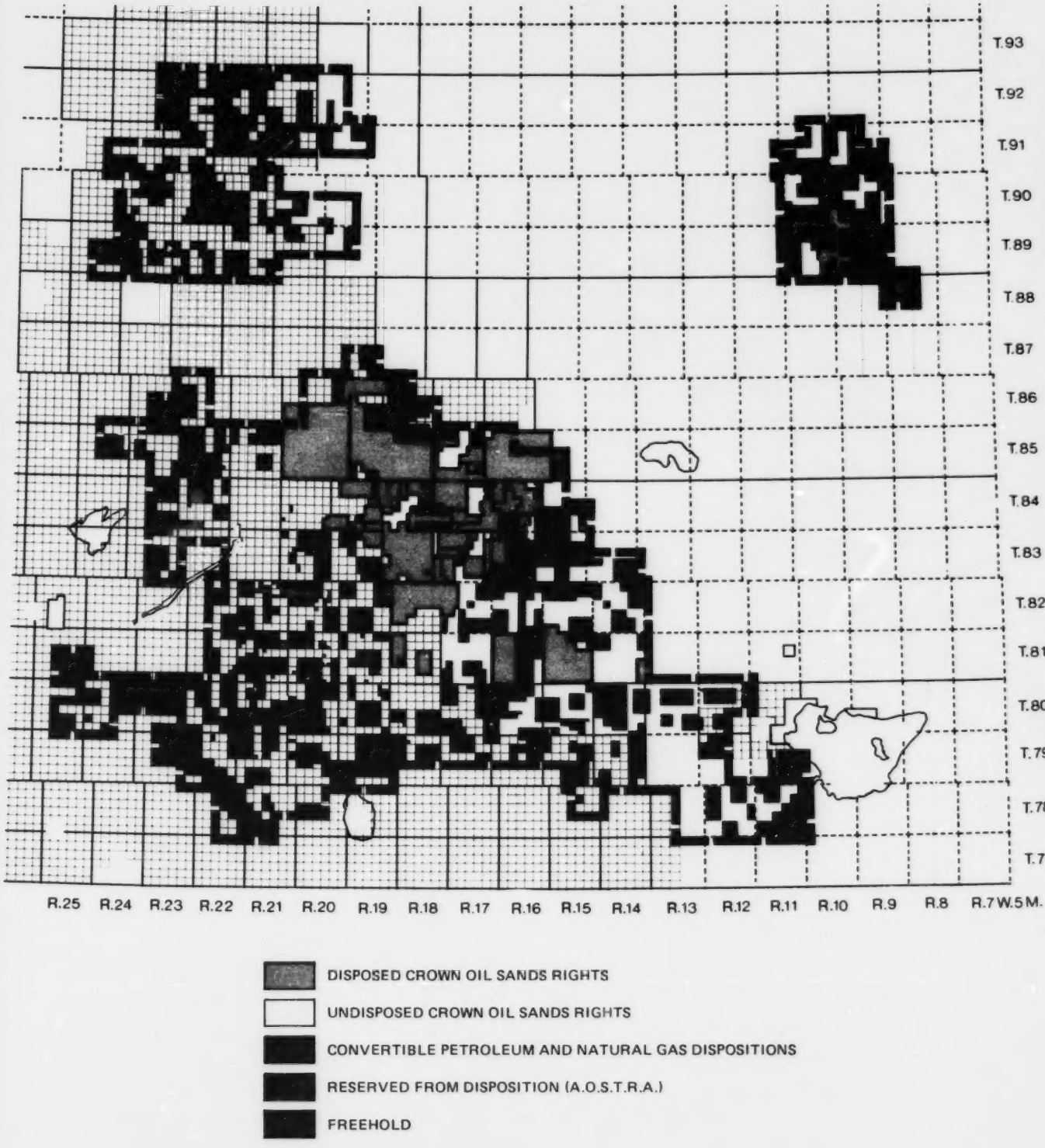
The crude bitumen in the Peace River deposit occurs in the Bluesky Formation and the Gething and Cadomin Formations of the Bullhead Group.The contact between the Gething and Bluesky is difficult to determine as the sequence is gradational from non-marine to marine. The formations are underlain by subcropping strata of Jurassic, Permian and Mississippian ages which also contain crude bitumen but as yet have not been adequately evaluated for estimate in-place reserves.

The deposit is buried by overburden ranging in depth from 1000 feet to over 2500 feet.

In-place reserves of crude bitumen in the evaluated area are estimated to be 64 billion barrels and no proved recoverable reserves have yet been assigned. A combination of geological conditions is believed to make this deposit more favourable for development by in-situ methods than the Athabasca deposit.

One project is operating in the Peace River deposit and will be fully underway in 1980. The process involves conventional steam drive with added pressurization and blowdown cycles to achieve optimum recovery of the bitumen. The separation plant has a design capacity of 3500 barrels per day of bitumen and 15 500 barrels per day of water.

At the end of 1978 companies held 276 596 acres in oil sands leases and an additional 63 840 acres in the form of Oil Sands Prospecting Permits. Undisposed Crown rights amounted to 841 120 acres.



MAP 5. DISPOSITION OF LANDS IN THE EVALUATED AREA OF THE PEACE RIVER BLUESKY-BULLHEAD DEPOSIT

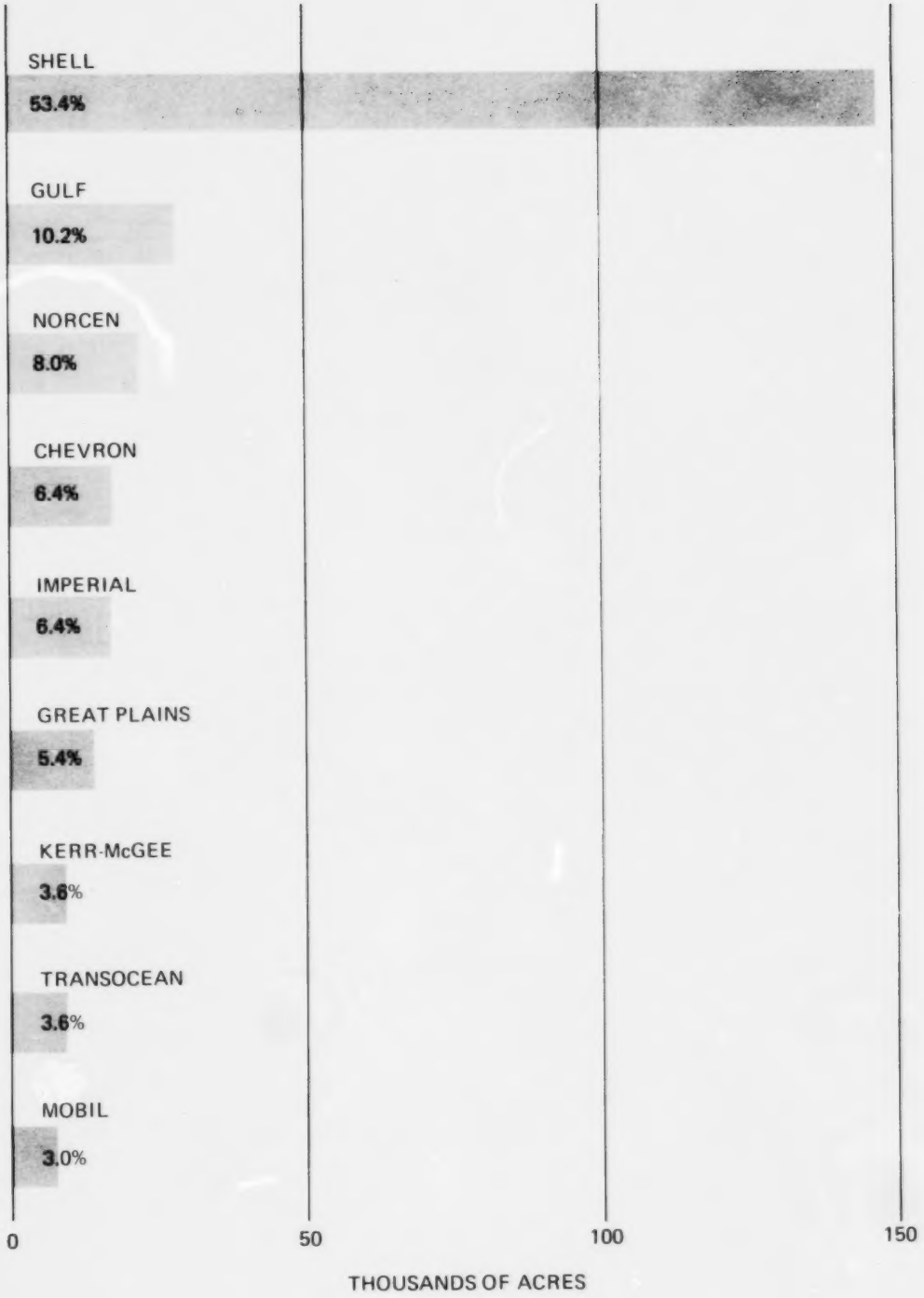


FIGURE 15. COMPARISON OF HOLDINGS OF CROWN LEASES BY INDIVIDUAL COMPANIES IN THE PEACE RIVER BLUESKY-BULLHEAD DEPOSIT

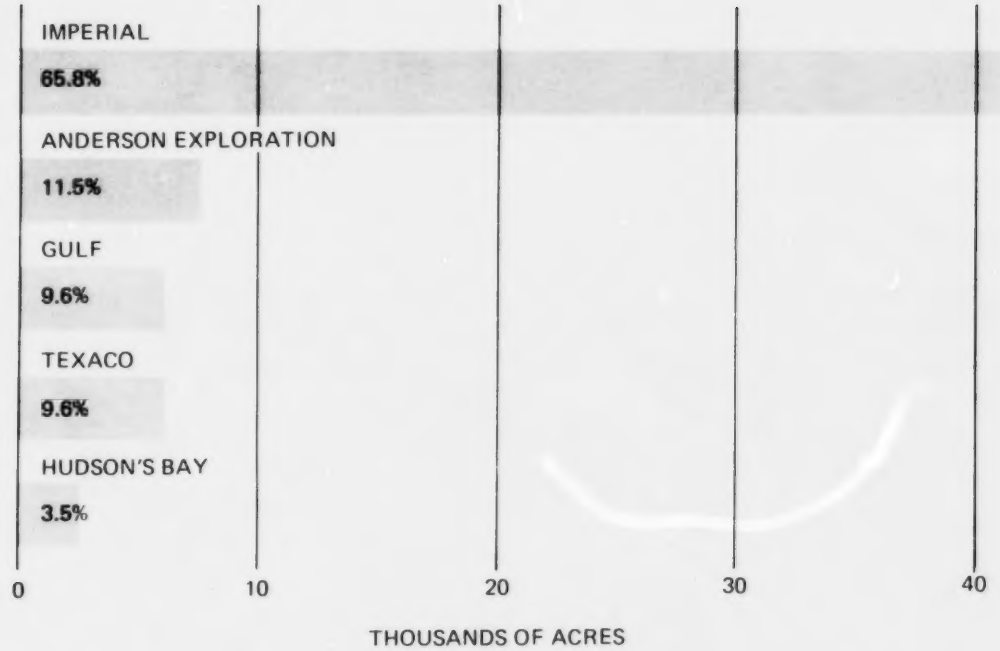


FIGURE 16. COMPARISON OF HOLDINGS OF CROWN OIL SANDS PROSPECTING PERMITS BY INDIVIDUAL COMPANIES IN THE PEACE RIVER BLUESKY-BULLHEAD DEPOSIT

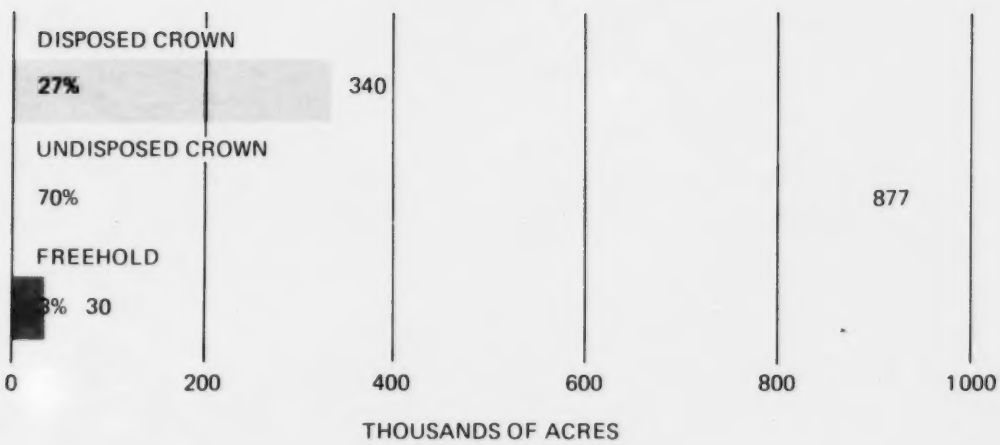


FIGURE 17. COMPARISON OF DISPOSED CROWN RIGHTS, UNDISPOSED CROWN RIGHTS AND FREEHOLD ACREAGE IN THE PEACE RIVER BLUESKY-BULLHEAD DEPOSIT

Table 5
DISPOSITION OF OIL SANDS LEASES
IN THE PEACE RIVER BLUESKY-BULLHEAD OIL SANDS DEPOSIT

COMPANY	OIL SANDS LEASES					
	Lease Number	Acres	%	Interest Acres	Issue/Expiry Date	
Chevron Canada Limited	83	35 713	50	17 857	'76	'97
Great Plains Oil & Gas Ltd.	66	36 969	40	14 788	'72	'93
Gulf Oil Canada Limited	0977020002	24 160	100	24 160	'77	'98
	0977040003	4 000	100	4 000	'77	'98
TOTAL		28 160		28 160		
Imperial Oil Enterprises Ltd.	83	35 713	50	17 856	'76	'97
Kerr-McGee Corporation	65	19 801	50	9 900	'72	'93
Mobil Oil Canada, Ltd.	89	8 236	100	8 236	'76	'97
Norcen Energy Resources Limited	66	36 969	60	22 181	'72	'93
Shell Canada Resources Limited (50%)	1	35 918	100	35 918	'61	'82
Shell Explorer Limited (50%)	21	46 843	100	46 843	'64	'85
	22	7 768	100	7 768	'64	'85
	23	4 048	100	4 048	'64	'85
	24	4 364	100	4 364	'64	'85
	25	3 536	100	3 536	'64	'85
	26	8 752	100	8 752	'65	'86
	44	7 444	100	7 444	'69	'90
	55	7 116	100	7 116	'70	'91
	68	21 928	100	21 928	'74	'95
TOTAL		147 717		147 717		
Transocean Oil, Inc.	65	19 801	50	9 901	'72	'93

All-Companies (Interest Acres) 276 596

WABASCA

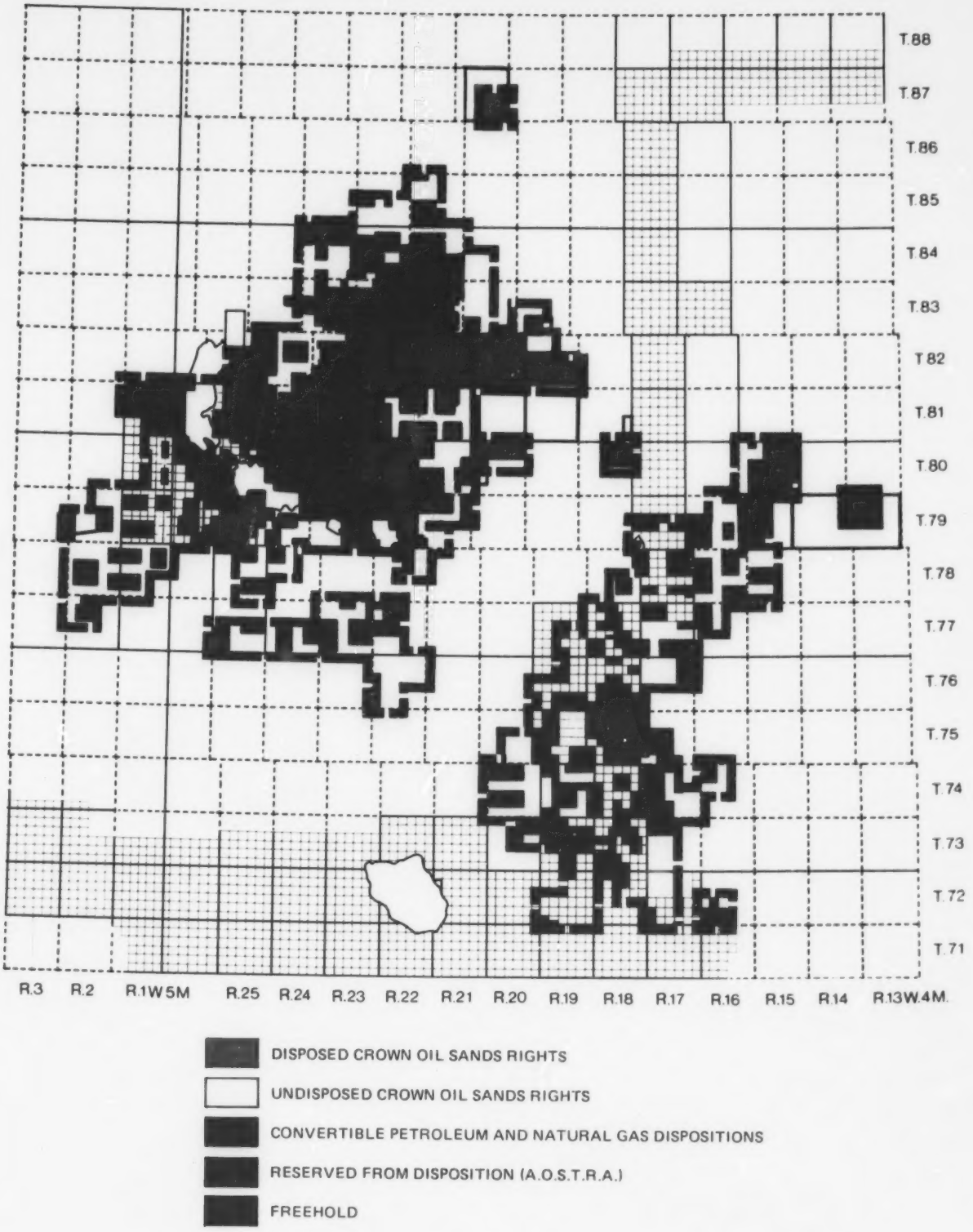
THE WABASCA OIL SANDS DEPOSITS

The Wabasca oil sands are made up of three separate deposits covered by overburden ranging from 500 feet to over 1500 feet. The deposits are contained in the Grand Rapids Formation of Lower Cretaceous age and are of fairly massive, continuous sands of non-marine origin.

In-place reserves of crude bitumen in the evaluated area of the three units are estimated to be 24 billion barrels and no proved recoverable reserves of crude bitumen have yet been assigned to them. Wabasca contains the most viscous bitumen of any deposit in Alberta and its potential is the least known.

A fireflood project has been operating in Wabasca since 1978. The project employs a process whereby the bitumen is ignited and fed with air through an injector well to promote combustion. Six observation wells monitor the extent of combustion in the deposit and the crude bitumen is pumped to the surface through four wells.

At the end of 1978, 13 companies held 307 176 acres in oil sands leases and one company held 39 840 acres in the form of an Oil Sands Prospecting Permit.



MAP 6. DISPOSITION OF LANDS IN THE EVALUATED AREA OF THE WABASCA DEPOSITS

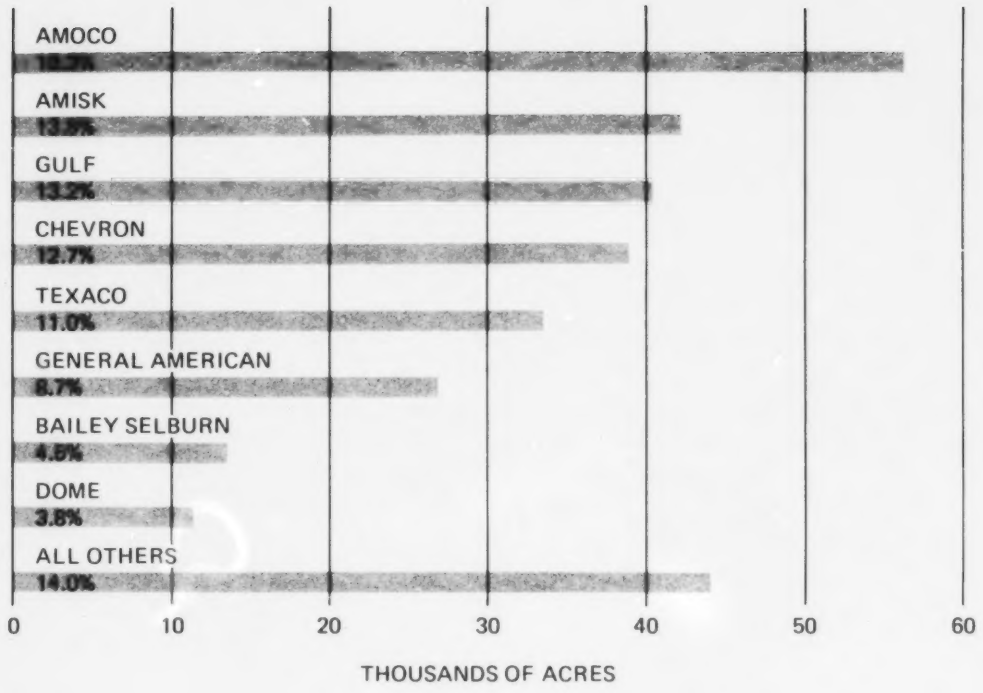


FIGURE 18. COMPARISON OF HOLDINGS OF CROWN LEASES BY INDIVIDUAL COMPANIES IN THE WABASCA DEPOSITS

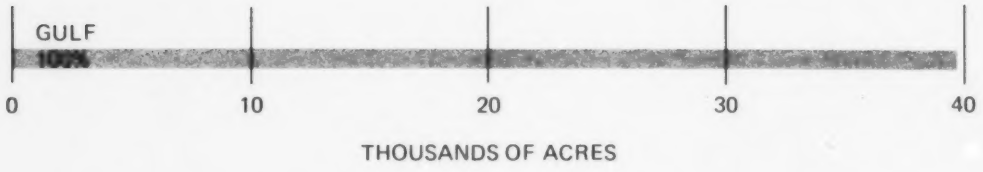


FIGURE 19. COMPARISON OF HOLDINGS OF CROWN OIL SANDS PROSPECTING PERMITS BY INDIVIDUAL COMPANIES IN THE WABASCA DEPOSITS

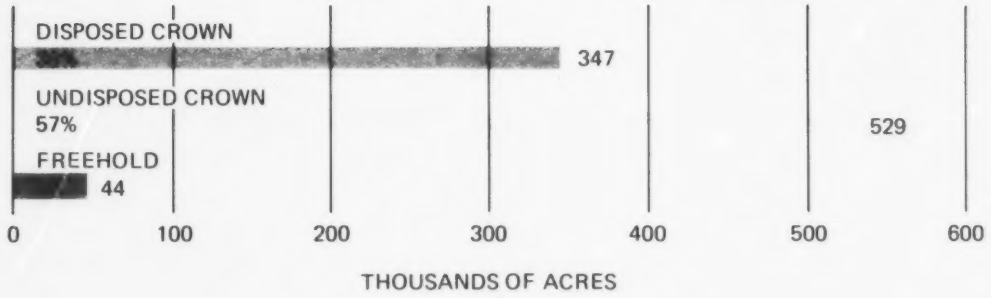


FIGURE 20. COMPARISON OF DISPOSED CROWN RIGHTS, UNDISPOSED CROWN RIGHTS AND FREEHOLD ACREAGE IN THE WABASCA DEPOSITS

Table 6
DISPOSITION OF OIL SANDS LEASES IN THE WABASCA OIL SANDS DEPOSITS

COMPANY	OIL SANDS LEASES					
	Lease Number	Acres	Interest %	Interest Acres	Issue/Expiry Date	
Amisk Oil Co. Ltd	0977030001	23 040	50	11 520	'77	'98
	0977030002	30 720	100	30 720	'77	'98
TOTAL		53 760		42 240		
Amoco Canada Petroleum Company Ltd.	67	41 457	100	41 457	'73	'94
	76	4 160	50	2 080	'76	'97
	85	6 400	100	6 400	'76	'97
	0977040002	6 400	100	6 400	'77	'98
TOTAL		58 417		56 337		
Bailey Selburn Oil & Gas Ltd.	0977060003	25 600	54	13 824	'77	'98
Canada-Cities Services, Ltd.	(1) 19	23 040	33.33	7 680	'61	'82
Canadian Homestead Oils Limited	35	18 809	50	9 405	'67	'88
Chevron Canada Limited	82	39 062	100	39 062	'76	'97
Dome Petroleum Limited	0977060003	25 600	46	11 776	'77	'98
General American Oils Ltd.	0977030001	23 040	50	11 520	'77	'98
	(2) 0978030002	15 360	100	15 360	'78	'99
TOTAL		38 400		26 880		
Gulf Oil Canada Limited	76	4 160	50	2 080	'76	'97
	86	12 800	100	12 800	'76	'97
	87	6 400	100	6 400	'76	'97
	88	6 400	100	6 400	'76	'97
	0977070001	12 814	100	12 814	'77	'98
TOTAL		42 574		40 494		
Imperial Oil Limited	(1) 19	23 040	33.33	7 680	'61	'82
Petro-Canada Exploration Inc.	(1) 19	23 040	33.33	7 680	'61	'82
Petrofina Canada Ltd.	43	10 376	100	10 376	'69	'90
Texaco Canada Inc.	35	18 809	50	9 404	'67	'88
	37	11 369	100	11 369	'67	'88
	74	12 969	100	12 969	'75	'96
TOTAL		43 147		33 742		
ALL COMPANIES (INTEREST ACRES)				307 176		

(1) This lease contains an additional 13 930 acres (4643 interest acres) in the presently established limits of the Athabasca Wabiskaw-McMurray Deposit.

(2) This lease contains an additional 23 040 acres in the presently established limits of the Athabasca Wabiskaw-McMurray Deposit.

APPENDICES

Alberta

File No.282-2 Gen.

ENERGY AND
NATURAL RESOURCES
Minerals Disposition Division

Telex 037-367
Petroleum Plaza—South Tow
9915 - 108 Stre
Edmonton, Alberta, Canad
T5K 2C

April 10, 1979

ENERGY RESOURCES

INFORMATION LETTER 79-5

SUBJECT: The Mines and Minerals Amendment Act, 1978
Bituminous and Oil Sands Legislation

With the approach of the March 21, 1980 deadline referred to in Energy Resources Information Letter 78-20, the Department has been requested to clarify its current administrative policies in regard to Item C.2. of Information Letter 78-11 and Item 1. of Information Letter 78-20.

Holders of bituminous sands leases who make application to have the Department issue substitutional oil sands leases, upon the granting of the oil sands lease and without the need to drill a "producing well" as defined by Section 109(d) of The Mines and Minerals Act, will be entitled to apply for the petroleum and natural gas rights in only the McMurray formation as defined in section 2.(1)2. or as determined pursuant to section 171.(4) of the Act.

Applications for the undisposed Crown petroleum and natural gas rights in all zones down to the base of the oil sands zone as designated by the zone designation in the substitutional oil sands leases may, however, be considered if a "producing well" is drilled on the location of such oil sands lease subsequent to its issue. This well must be drilled to the base of the designated zone and a full-hole core must be taken from the top of the zone to the lowermost bitumen-water interface in the zone.

For further information please call the Director - Petroleum and Natural Gas Agreements at 427-6603 or the Assistant Deputy Minister - Minerals Disposition Division at 427-7725.

M. J. Day, P. Geol.
Assistant Deputy Minister
Minerals Disposition Division

Alberta

ENERGY AND
NATURAL RESOURCES

File No. 282-2 Gen.

Telex 037-36
Petroleum Plaza — South Tow
9915 - 108 Str
Edmonton, Alberta, Cana
T5K 2

ENERGY RESOURCES
INFORMATION LETTER 78-20

July 26, 1978.

SUBJECT: The Mines and Minerals Amendment Act, 1978
Bituminous and Oil Sands Legislation

In anticipation of the wording to be employed in Oil Sands Regulation, 1978 (about to be filed), item B.1. of Information Letter 78-11 requires clarification, particularly in regard to the time period in which the lessee of oil sands rights who has demonstrated the existence of petroleum or natural gas may make application for those undisposed petroleum and natural gas rights which occur stratigraphically above the base of the deepest zone containing oil sands and to which the oil sands agreement pertains. In addition, this Regulation and the 1978 amendments to The Mines and Minerals Act allow for direct disposition of oil sands rights and enable the Department to change its petroleum and natural gas posting policies in oil sands areas.

1. Rights of Oil Sands Agreement Holders to Apply for Petroleum and Natural Gas Leases

The holder of an oil sands agreement will have until March 31, 1980 to apply for a lease of the undisposed petroleum and natural gas rights where a "producing well" as defined by section 109(d) of the Act exists on his location at the time the application is made. The petroleum and natural gas lease, to be issued pursuant to section 112(1)(c) of the Act, may comprise the entire area of the oil sands agreement and will be issued subject to such terms and conditions as may be prescribed by the Minister.

2. Posting of Petroleum and Natural Gas Leases and Licences

Except in regard to specified areas set aside for the Alberta Oil Sands Technology and Research Authority (AOSTRA) and effective immediately, the Department will consider requests for posting undisposed petroleum and natural gas rights in areas known or believed to contain oil sands, including that area described in section 2(1)2 of The Mines and Minerals Act (the Bituminous Sands Area) as the Act stood on June 30, 1978. The areas reserved for AOSTRA will be described on a map of Alberta entitled "Oil and Gas Exploration and Development - Restricted Areas" about to be published.

In situations where the Department agrees to post a parcel, all rights shall be excepted within and stratigraphically above the base of any zone that is subject to a subsisting bituminous or oil sands agreement that was in existence on June 30, 1978. This restriction will not apply after April 1, 1980. Where the petroleum and natural gas rights in a zone were excepted from an agreement because of the probability of oil sands, the petroleum and natural gas rights in the zone will, upon request, be made available by public tender.

... 2.

3. Substitution of Oil Sands for Bituminous Sands Rights

Holders of bituminous sands leases may apply for oil sands leases in substitution therefor at any time. However, the Department will insist upon substitution should the Minister consent to consolidation, division, transfer, partial surrender, renewal, reinstatement or (item C.2 of Information Letter 78-11) the issue of a petroleum and natural gas lease.

The intent of section 171 (as amended effective July 1, 1978) is to ensure that when the Department effects a substitution, the resultant oil sands lease will contain a zone designation pertaining to the Wabiskaw-McMurray zone, covering the portion of that zone which would have contained oil sands as oil sands were defined prior to July 1978. (It is not intended that this section should overrule a pre-existing zone designation contained in an oil sands agreement which exists outside the former bituminous sands area.)

4. Oil Sands Work Programs

Individual lessees of oil sands and bituminous sands leases are being contacted for their views concerning the second five-year oil sands evaluation (work program) cycle which will commence January 1, 1982.

5. Oil Sands Disposition Policy

Although the Oil Sands Regulation, 1978 will make provision for direct acquisition of oil sands rights (i.e. without the need for subsisting petroleum and natural gas agreements as described in item A of Information Letter 78-11), the Department is not prepared to accept such applications at this time. Any change in this policy will be announced by Information Letter.

As pointed out in Information Letter 78-11, situations requiring case-by-case treatment are expected to arise. For further information please contact the

Director - Petroleum and Natural Gas Agreements 427-6603 (Item 1)
Director - Oil and Gas Sales 427-7709 (Item 2)
Director - Mineral Agreements 427-8167 (Item 3)
Director - Exploration Review 427-6602 (Item 4)

or the undersigned at 427-7725.

M. J. Day, P. Geol,.
Assistant Deputy Minister,
Minerals Disposition Division.

Alberta

ENERGY AND
NATURAL RESOURCES

File No.

Telex 037-3676
Petroleum Plaza — South Tower
9915 - 108 Street
Edmonton, Alberta, Canada
T5K 2C9

May 19, 1978

ENERGY RESOURCES

INFORMATION LETTER 78-11

SUBJECT: The Mines and Minerals Amendment Act, 1978
Bituminous and Oil Sands Legislation

The Mines and Minerals Amendment Act, 1978 (Bill 39), passed at the recent sitting of the Legislative Assembly contains, among other changes to legislation, amendments to those sections of The Act dealing with Crown bituminous and oil sands rights. These amendments are scheduled to come into force on July 1, 1978.

The need for these amendments has been evident to the Department for some time in view of exploration activity in those areas of the Province where holders of Crown petroleum and natural gas agreements have discovered the presence of both bitumen-impregnated sands and associated natural gas within the same formation or zone. Under existing legislation, the Department was restricted as to the manner in which the rights found could be disposed of, and some uncertainties existed about the exact rights conveyed in an exploration or lease agreement granted in locations containing both bitumen- and gas-impregnated zones. Additionally, it has been evident that the existing distinction between "oil sands" and "bituminous sands" as expressed in The Act and in the Regulations was obsolete. These problems were the subject of several discussions during the past year between Department and industry representatives, including representatives of various companies holding leases in the bituminous and oil sands areas of the Province.

The amendments of interest here are those contained in:

> Section 2(1)20, which redefines "oil sands" to preclude associated petroleum and natural gas which may be recovered through a well by conventional methods. This will permit the rights to such petroleum and natural gas to be disposed of under Part 5 of The Act.
>
> Section 171, which provides for the merging of bituminous sands rights into oil sands rights.

The effects of these changes can be summarized as follows:

A. Holders of Crown Petroleum and Natural Gas Agreements

1. With respect to P. & N.G. Agreements issued prior to July 1, 1978

(a) Where, prior to the coming into force of this legislation, a lessee makes application to acquire oil sands rights, he will be required in accordance with section 9 of the Oil Sands Regulations to surrender his rights to the petroleum and natural gas in the zone or zones containing the oil sands.

(b) Where, after July 1, 1978, a lessee makes application to acquire oil sands rights, under the Amended Oil Sands Regulations he will not be required to surrender from his agreement the petroleum and natural gas in the zone. The consequential oil sands agreement will only relate to the oil sands as defined by the amended Act.

2. With respect to P. & N.G. Agreements issued after July 1, 1978

These will not convey to the holder the right to acquire oil sands rights.

B. Holders of Crown Oil Sands Agreements

1. Agreements issued prior to July 1, 1978

Where by drilling a well in the location the holder of an oil sands agreement has determined the presence of petroleum or natural gas in paying quantity, either in the zone comprising the oil sands agreement or in a zone stratigraphically above, he may apply for the undisposed petroleum and natural gas rights in that part of the location that is stratigraphically above the base of the zone containing the oil sands.

2. Agreements issued after July 1, 1978

After July 1, 1978, the Crown's oil sands rights may be acquired in a manner and under such conditions as may be prescribed from time to time.

C. Holders of Bituminous Sands Rights

1. Substitutional Oil Sands Lease

Under section 171(5) of the amended Act the holder of a bituminous sands lease may make application for and the Department may issue to him a substitutional oil sands lease.

2. P. & N.G. rights in McMurray Formation

Where the option outlined in C(1) above is exercised, the lessee will be entitled to apply, upon the issuance of the oil sands lease to him, for a lease of those undisposed Crown petroleum and natural gas rights in the McMurray formation that the Department deems would have been "associated" under the former definition of oil sands.

This letter sets out the manner in which the Department anticipates treating most situations which will arise under the new legislation. It is anticipated the legislation will be sufficiently flexible, however, to accommodate in a logical manner situations not described above. For further information please call the Director - Petroleum and Natural Gas Agreements at 427-6603 or the Assistant Deputy Minister - Minerals Disposition Division at 427-7725.

G. B. Mellon, P. Geol.,
Deputy Minister - Energy Resources

OIL SANDS REGULATION, 1978
ALBERTA REGULATION 317/78
(filed August 9, 1978)

1. In this regulation,
   (a) "Department" means the Department of Energy and Natural Resources;
   (b) "lease" means an oil sands lease;
   (c) "Minister" means the Minister of Energy and Natural Resources;
   (d) "oil sands" and "oil sands rights" have the meaning given them in The Mines and Minerals Act;
   (e) "permit" means an oil sands prospecting permit issued under this regulation or any predecessor of this regulation;
   (f) "permittee" means the holder of a permit according to the records of the Department;
   (g) "work program" means any program of work and, without restricting the generality of the foregoing, includes
      (i) geophysical, exploratory, drilling, evaluation, development and other work carried out on the lands contained in an oil sands lease, and
      (ii) experimental recovery schemes, pilot projects and research and development work performed in Alberta in relation to oil sands.

Permits

2. (1) Upon drilling a well or wells determining the presence of oil sands,
   (a) the holder of a reservation, permit or lease of petroleum and natural gas rights granted before July 1, 1978, or
   (b) the holder of a lease of petroleum and natural gas rights granted on or after July 1, 1978 but out of a licence, reservation or permit of petroleum and natural gas rights granted before July 1, 1978,

may apply for an oil sands prospecting permit pertaining to a zone contained in that reservation, permit or lease of petroleum and natural gas rights.

(2) An application under subsection (1) may, with the consent of the Minister, include other lands.

3. (1) Subject to the rights of persons permitted to make application under section 2, any person may apply for a permit by filing an application with the Department.

(2) An application under subsection (1) shall be made
   (a) in person where the applicant is a natural person, or
   (b) by an agent in person where the applicant is a corporation.

4. (1) An application for a permit shall be accompanied by
   (a) a fee of $250,
   (b) the rental for the first year of the term at the rate of 5 cents an acre, and
   (c) a deposit of $50 000.

(2) The deposit may be in the form of

(a) cash,

(b) negotiable bearer bonds

(i) issued by the Government of Canada or the Government of Alberta, or

(ii) guaranteed as to principal and interest by the Government of Alberta,

and having an interest rate of not less than 6% per annum or having a date of maturity not more than 6 years after the date of presentation,

(c) term savings certificates issued by a treasury branch, and assigned as to principal to the Minister, or

(d) promissory notes satisfactory to the Minister and approved for issue by a bank.

(3) The fee, rental and deposit shall be refunded or returned if the granting of the permit is refused.

(4) The deposit shall be held by the Department as a guarantee that the examination will be carried out in accordance with this regulation.

(5) The deposit shall be forfeited to the Crown if during the currency of the permit an examination satisfactory to the Minister was not made in accordance with the plan of examination.

5. A person is entitled to a permit where he applies for the permit in accordance with this regulation and the Minister considers the granting of the permit warranted in the circumstances.

6. The maximum area of a permit shall be 50 000 acres and its boundaries shall be in the discretion of the Minister.

7. The proposed plan of examination to be conducted shall be included in the application and if the proposed plan is approved by the Minister the application may be granted.

8. The permit shall be in such form as may be determined by the Minister and may include such terms and conditions as the Minister may prescribe.

9. (1) The permittee is prohibited from transferring a part of the location contained in the permit.

(2) Subject to subsection (1), the permittee may transfer the permit to the extent permitted under The Mines and Minerals Act.

10. (1) A permit conveys the right to search for, mine, quarry, work and remove oil sands in lands contained in the permit and to extract products therefrom in an amount necessary for the permittee to carry out proper tests of the oil sands, but subject to any exceptions expressed in the permit.

(2) The permittee shall not dispose of oil sands or products recovered therefrom without the consent in writing of the Minister.

11. (1) The term of a permit shall be one year from the date of the permit, renewable for a second term of one year upon payment of rental for the second year at the rate of 10 cents an acre and renewable for a third term of one year upon payment of rental for the third year at the rate of 10 cents an acre.

(2) With each application for renewal the permittee shall supply a report on the progress of the examination carried out together with an estimate of the cost thereof and particulars of the extent and nature of the work to be conducted during the next term.

12. The plan of examination as approved may not be subsequently varied in any way without the prior consent of the Minister.

13. The permittee shall furnish to the Minister or to his authorized representative a complete copy of every log taken of each hole drilled and such other information, data and reports pertaining to the examination as the Minister may from time to time require.

14. Upon the termination of a permit, the permittee shall furnish to the Minister a statutory declaration setting forth the several items of expenditure incurred in the examination and the specific purpose for which each item was expended.

15. A permittee may, with the consent of the Minister, surrender at any time, or from time to time, any part of the lands contained in the permit.

16. A permittee, with the consent of the Minister, may consolidate two or more adjacent permits into one permit if the area of the new location of the permit does not exceed 50 000 acres.

17. A permit may be terminated at any time at the option of the permittee, and if he has complied with this regulation he shall have the exclusive right to apply for a lease of oil sands rights in lands contained in the permit.

18. If a permittee does not make application for a lease and has complied with the terms and conditions of the permit to the satisfaction of the Minister, the deposit will be refunded.

19. The permittee shall comply with the provisions of The Mines and Minerals Act, The Quarries Regulation Act and The Oil and Gas Conservation Act, and with the provisions of any regulations under any of those Acts.

20. In the event of failure to comply with any of the terms or conditions of the permit, the Minister shall cause written notice to be mailed to the permittee indicating that the permit may be cancelled unless within 30 days after the date of the notice the permittee remedies the default to the satisfaction of the Minister.

Leases

21. The lands that may be acquired under a lease shall be determined by the Minister after consultation with the permittee and after taking into consideration the extent and nature of the oil sands proven by the permittee's examination, the proposed capacity of the plant or other works to be constructed and the requirements for operation of the plant for a period of at least 30 years.

22. A lease grants the oil sands rights in the location, but subject to any exceptions expressed in the lease.

23. (1) A lease shall require that, within one year from the date upon which the lessee is given notice by the Minister to do so, the lessee shall commence the construction of the plant or other works, and shall complete the plant or other works and place them in operation within 4 years from the date of the notice by the Minister, and thereafter shall carry on the processing of the oil sands or extraction of products diligently and continuously to the satisfaction of the Minister.

(2) The notice by the Minister shall not be given until the expiration of at least one year from the date of the lease.

24. The term of a lease shall be 21 years

(a) renewable for one term of 21 years, and

(b) so long as the plant or other works are in operation, renewable for further terms each of 21 years,

subject in the case of each renewal to the terms and conditions prescribed at the time the renewal is granted, and to the provisions of The Mines and Minerals Act and the regulations.

25. A lease shall be in such form as may be determined by the Minister and may include such terms and conditions as the Minister may prescribe.

26. The annual rental of a lease, payable yearly in advance, shall be $1 an acre.

27. (1) The deposit for a lease shall be $5 for each acre contained in the lease but in no case shall the maximum deposit exceed $50 000 or the minimum be less than $10 000.

(2) Where application for lease is made at the termination of a permit, any deposit in excess of the deposit required for the lease under subsection (1) shall be refunded.

(3) Upon the completion of the construction of the plant or other works satisfactory to the Minister, the deposit shall be refunded.

28. (1) The lessee may surrender his lease at any time or, with the consent of the Minister, may surrender at any time or from time to time any part of the lands contained in the lease.

(2) Upon surrender of a lease, the deposit shall be refunded if the lessee has complied with the terms and conditions of the lease.

29. (1) The lessee is prohibited from transferring a part of the location contained in the lease unless the consent of the Minister is first obtained.

(2) Subject to subsection (1), the lessee may transfer the lease to the extent permitted under The Mines and Minerals Act.

30. (1) The lessee shall, on or before a date specified by the Minister, submit to the Minister for his approval a work program for his lease for a period of not more than 5 years.

(2) The Minister may

(a) at the end of a work program approved under subsection (1) direct the lessee to submit a second work program for his approval, and

(b) at the end of the second work program direct the lessee to submit a third work program for his approval,

and so on with respect to succeeding work programs, so that at the end of each work program the Minister may direct the lessee to submit a further work program for his approval.

(3) Each work program submitted to the Minister for his approval under subsection (2) shall be for such period of time as may be determined through consultation between the Minister and the lessee.

(4) Each work program approved under this section shall consist of work equivalent to an expenditure of not less than $2 an acre for each year of the work program.

(5) If, during the course of conducting a work program, the lessee finds that certain work not included in his work program may be beneficial to the whole of the work program, the work program may be varied with the consent in writing of the Minister.

(6) The Minister may take into consideration any work performed on the lands contained in a permit or a lease prior to the date specified by the Minister for the submission of the work program under subsection (1) as satisfying a portion or all of a work program approved under this section.

(7) At the end of a work program under subsection (1), a lessee shall submit to the Minister interpretational data, maps and other information obtained from the completed work program as the Minister may request.

(8) Where the lessee

(a) fails to submit a work program to the Minister pursuant to subsection (1) or (2),

(b) fails to carry out to the satisfaction of the Minister a work program approved under this section, or

(c) fails to submit the interpretational data, maps and other information required under subsection (7),

the Minister may cancel the lease.

General

31. (1) An application may be made for a lease by a person other than a permittee.

(2) Where an application is made for a lease pursuant to subsection (1),

(a) the application shall be accompanied by the rental for the first year of the term of the lease and the deposit;

(b) the Minister may grant the lease where the Minister considers the granting of the lease warranted in the circumstances;

(c) the rental and deposit shall be refunded or returned if the granting of the lease is refused;

(d) sections 21 to 30 apply to applicant and to the lease as though the applicant were a permittee;

(e) section 4(2) applies to the deposit made by the applicant.

32. Where any question arises pertaining to the interpretation or application of this regulation, the Minister shall be the sole judge and there shall be no appeal from his decision.

33. The following are repealed:

(a) Bituminous Sands Regulations, 1962 (Alta. Reg. 342/62), as amended;

(b) Oil Sands Regulations, 1962 (Alta. Reg. 378/62), as amended;

(c) Oil Sands Regulations, 1969 (Alta. Reg. 298/69).

OIL SANDS ROYALTY REGULATION NO. 1
ALBERTA REGULATION 318/78

(filed August 9, 1978)

1. In this regulation,
   (a) "Act" means The Mines and Minerals Act;
   (b) "barrel" means 34.9723 gallons;
   (c) "Minister" means the Minister of Energy and Natural Resources;
   (d) "oil sands" means oil sands as defined in the Act.

2. This regulation applies to the operations of Great Canadian Oil Sands Limited, its successors and assigns, in the locations described in
   (a) Bituminous Sands Lease No. 17-A,
   (b) Bituminous Sands Lease No. 23-A, and
   (c) Bituminous Sands Lease No. 86,

and any oil sands lease issued in substitution thereof pursuant to section 171(5) of the Act and any renewals of the original or substituted leases.

3. The royalty to be computed, levied and collected by the Crown in right of Alberta on all products derived from the oil sands shall be that part of the products derived during each calendar month calculated, free and clear of any deductions, as follows:
   (a) with respect to synthetic crude oil, in accordance with the Table to this regulation;
   (b) with respect to each of the other products, 16⅔.

4. Any sale of the products, until otherwise ordered by the Minister, shall include the royalty share of such products belonging to the Crown.

5. No royalty shall be payable on any products, other than synthetic crude oil, consumed in the operations.

6. The Minister may remit or rebate the royalty levied in any month on synthetic crude oil consumed in the operations.

7. The deductions that may be allowed for charges incurred in transporting the products shall be the deductions specified by the Minister.

8. Where any question arises pertaining to the interpretation of this regulation, the Minister shall be the sole judge and there shall be no appeal from his decision.

9. Bituminous Sands Royalty Regulation No. 1, filed as Alberta Regulation 33/63, as amended, is repealed.

TABLE

Monthly Production in Barrels	Crown Royalty for the Month in Barrels
0 to 900 000	8% of the number of barrels produced
900 000 and over	72 000 plus 20% of the number of barrels produced in excess of 900 000.

[IL-2-1]

THE MINES AND MINERALS ACT
THE EXPERIMENTAL OIL SANDS ROYALTY REGULATIONS
ALBERTA REGULATION 287/77
(Filed October 20, 1977)

1. In these regulations,
   (a) "experimental project" means a scheme or operation referred to in section 43(3) of The Oil and Gas Conservation Act and approved by the Energy Resources Conservation Board pursuant to section 43 of that Act;
   (b) "Minister" means the Minister of Energy and Natural Resources;
   (c) "oil sands" includes bituminous sands;
   (d) "oil sands rights" includes bituminous sands rights.

2. The royalty payable to the Crown in right of Alberta
   (a) on all products derived during each month from oil sands, and
   (b) on all oil sands sold or otherwise disposed of during each month without processing or treatment,

recovered from the location of each lease of oil sands rights as a result of an experimental project conducted on that location is 5 per cent of those products or oil sands, as the case may be, free and clear of any deductions other than those referred to in section 5.

3. Any sale of products or oil sands, as the case may be, unless otherwise ordered by the Minister, shall include the royalty share of the products that belong to the Crown.

4. No royalty is payable on any products or oil sands consumed or lost in the operation of the experimental project.

5. The deductions that may be allowed for charges incurred in transporting the royalty share of the products or oil sands, as the case may be, that belong to the Crown shall be those deductions specified by the Minister.

6. These regulations apply with respect to products derived or oil sands sold, as the case may be, during the month of September, 1977 and subsequent months.